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AUTO-QUAL MODELLING SYSTEM

Robert L. Crim, et al

Environmental Protection Agency
Annapolis, Maryland

March 1973

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U.S. ENVIRONMENTAL PROTECTION AGENCY

AUTØ-QUAL MØDELLING SYSTEM

Technical Report 54
Environmental Protection Agency
Region III
Annapolis Field Office
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Errata

p. 67 4 statements below statement no. 20
read;

```
READ(NRD,30) I,X(J),Y(J)
```

p. 82 statement no. 50
read;

```
50 ALPHA(J,2)=Z(J)*A(J)/XLEN
```

p. 154 4 statements below statement no. 20
read;

```
READ(NRD,30) I,X(J),Y(J)
```

p. 166 2 statements below statement no. 150
read;

```
IF (DT.GE.24.0) DT=24.0
```

Annapolis Field Office
Environmental Protection Agency
Region III

AUTØ-QUAL MØDELLING SYSTEM

Technical Report 54

Robert L. Crim
Norman L. Lovelace

March 1973

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INTRODUCTION

The planning requirements contained in sections 303(e) and 208 of the recently passed Public Law 92-500 (Amendments to the Federal Water Pollution Control Act), have underscored the need for easily operated and accurate water quality planning tools. This report describes two mathematical models that have been designed to meet the specific needs of Federal, State or local planning agencies.

These two models are subsets of a large and complex system of models known as the "Comprehensive Modelling System" (CMS)[1]. It was recognized early that the CMS programs were essentially experimental tools for scientific investigation. As such, they did not lend themselves to easy operation by the general engineering community.

At the same time it was recognized that the field of water quality simulation was becoming self sufficient and that models were being developed for which no one had any real use. Large amounts of resources were being spent attempting to modify old programs to handle different conditions in different geographical areas.

It seemed the proper course to develop, from anew, a set of planning tools that incorporated the lessons learned from the CMS programs, yet were designed with planning needs in mind. The result of this effort is the AUTØ-QUAL set reported on here.

The AUTØ-QUAL set is designed specifically for water bodies where widths are small relative to their length. Most freshwater streams and tidal tributaries to estuarine bays fit that description. These

are waters whose net hydraulic circulation patterns are essentially unidirectional.

Compatibility with the STØRET [2] system, the GPSF [3] system and the AUTØMAP [4] project has been designed in by the use of a river mile index (RMI) for positioning inputs and diversions as well as geometric data and physical features. This should facilitate the storage and retrieval of the data required by the models and more closely tie the modelling activities to the planning process.

The notion of a fixed point in a freshwater system or a free flowing system may seem foreign initially. Specifically, it may be difficult to reconcile the transfer from the Lagrangian framework, best exemplified by the venerable Streeter-Phelps [5] equations to the Eulerian system used in the AUTØ-QUAL set.

The reader should recognize that the classic biochemical oxygen demand (BOD) equation:

$$L = L_o e^{-K_1 t}$$

where,

L = BOD at any time

L_o = BOD at t=0

t = time

k_1 = deoxygenation rate

e = naperian log base

is the integrated (with time) form of the standard first order decay equation ;

$$\frac{dL}{dt} = -k_1 L$$

which is a gross simplification of the mass transfer equation:

$$\frac{\partial L}{\partial t} = u \frac{\partial L}{\partial x} - E \frac{\partial^2 L}{\partial x^2} + \text{sources} - \text{sinks}$$

where; x = distance
u = velocity of flow
E = dispersion coefficient

and the sink term is $-k_1 L$.

Essentially the Streeter-Phelps equation as commonly used assumes that all physical features are constant along a stream bed, that the water particles do not intermingle, and that only time and decay rate (k_1) determine the resulting BOD concentration.

There is no good reason to cling to those assumptions. A section of this report compares the results of the AUTO-QUAL set and the Streeter-Phelps equation under identical conditions. Those comparisons demonstrate the validity of the Eulerian framework in free flowing streams.

MODEL DEVELOPMENT

The development of AUTØSS and AUTØQD has been broken into sections. Because the two models have many of the same properties, a general development is given first. The last two sections will deal with each model separately and discuss the particular solution techniques used.

CHANNEL REPRESENTATION:

The first problem to be resolved in a model development is how to represent the stream or estuary being modelled in terms that can be mathematically described and represented on a digital computer. The method of representation used in these models is called the "channel-junction" method. Essentially this method consists of dividing the natural channel into a finite number of sections (See Figure 1). Each of these sections contains a finite volume of water. These sections (discrete volumes of water) are assumed to be uniform at a given instant in time in all their properties. This assumption is generally referred to as the "fully mixed assumption". Thus, any property of this volume of water, for instance, a constituent concentration, represents the average value for that volume. This average value has a point value at the center of the volume. These discrete volumes of water are referred to as junctions.

Generally the system being modelled is not static. There will be flow and movement of water in the system. Thus, the problem of representing flow and the consequential transfer of properties from one junction to another has to be dealt with. For this reason the concept of channels is introduced. Physically a channel may be thought of as the interface between two junctions. Computationally the channel is treated as a uniform, rectangular channel between junction midpoints. Water properties are not associated with channels. Channels are used (computationally) for the transfer of properties from junction to junction.

Various properties are associated with either a channel or a junction; the properties of a channel are:

1. Flow (ft^3/sec)
2. Velocity (ft/sec)
3. Dispersion coefficient (ft^2/sec)
4. Cross-sectional area (ft^2)
5. Depth (ft)
6. Width (ft)
7. Length (ft or miles)

The properties of a junction are:

1. Volume (ft^3)
2. Surface area (ft^2)
3. Constituent concentrations (ppm)
4. Temperature (°C)
5. Evaporation - rainfall (in/month)
6. Inflows (ft^3/sec)
7. Diversions (ft^3/sec)
8. Reaeration rate (1/day)
9. Photosynthesis - respiration rate (gr O_2/m^2/day)
10. Sediment uptake rate (gr O_2/m^2/day)
11. CBØD decay rate (1/day)
12. NBØD decay rate (1/day)
13. Constituent masses (ppm-ft^3)
14. Inflow concentrations (ppm).

Some of the junction properties are computed from channel values. For instance, junction volumes are computed by using the channel depths and widths on either side of the junction.

The system of channels and junctions used in a model is commonly called the "network". This network can be visualized as a system of pots (junctions) connected by hoses (channels). The network is established automatically in AUTØSS and AUTØQD. However, some basic information is required:

1. Starting river mile
2. Ending river mile
3. Number of sections.

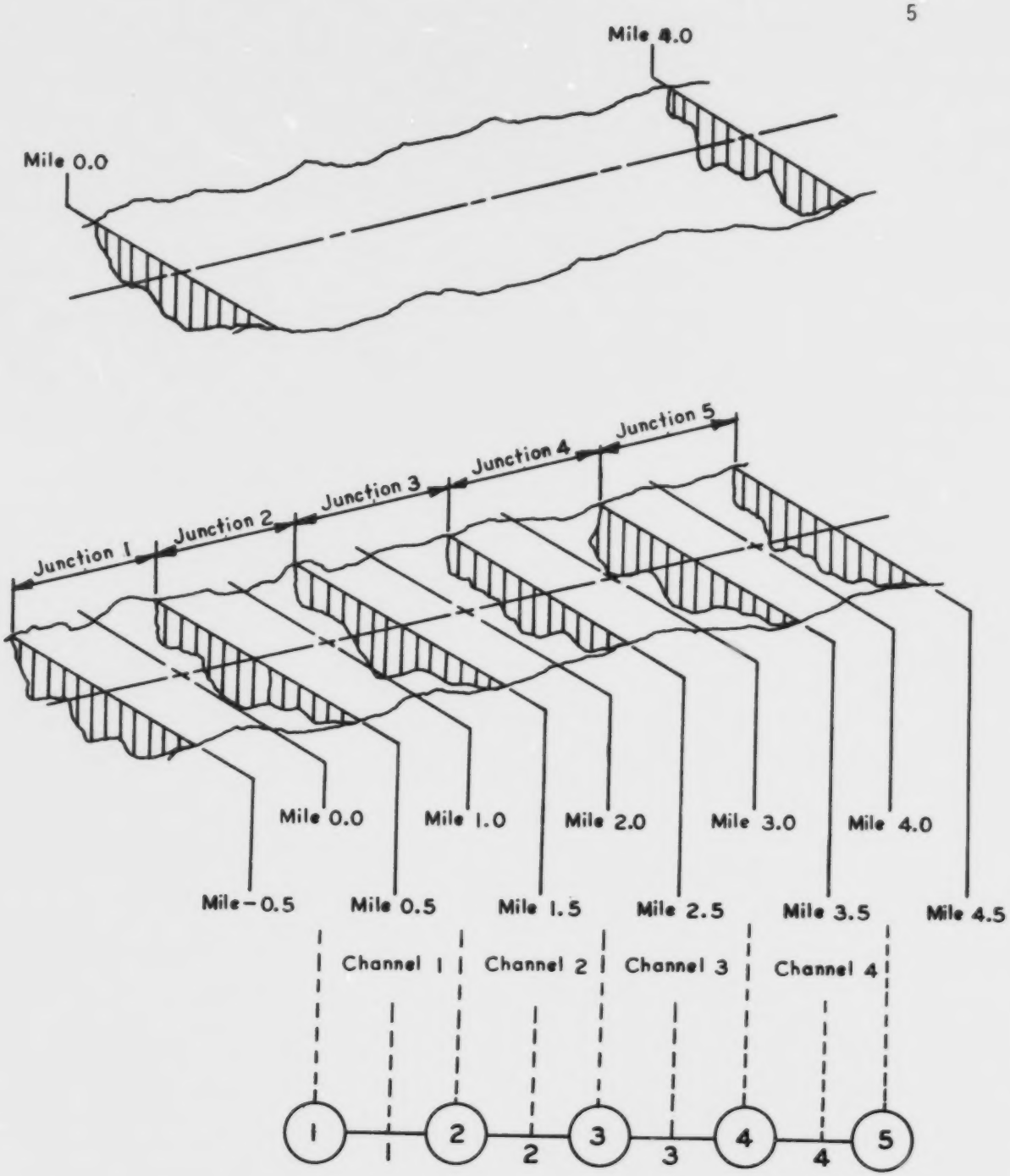
Thus far in the network representation the following assumptions have been made:

1. The natural channel can be accurately represented by a system of discrete volumes
2. Within each junction all water properties are uniform (fully mixed assumption)
3. Junction values have point values at the center of a junction.

These assumptions should be kept in mind when applying the models. Experience has shown that in most applications these assumptions are valid. However, some caution must be exercised in such cases as heavily stratified estuaries or impoundments.

The following example demonstrates how the network is established:

FIGURE 1


Mile 4.0
Mile 0.0
Junction 1
Junction 2
Junction 3
Junction 4
Junction 5
Mile 0.0
Mile 1.0
Mile 2.0
Mile 3.0
Mile 4.0
Mile -0.5
Mile 0.5
Mile 1.5
Mile 2.5
Mile 3.5
Mile 4.5
Channel 1
Channel 2
Channel 3
Channel 4
1
2
3
4
5
1
2
3
4

Given the basic data:

starting mile = 0.0

ending mile = 4.0

number of sections = 4

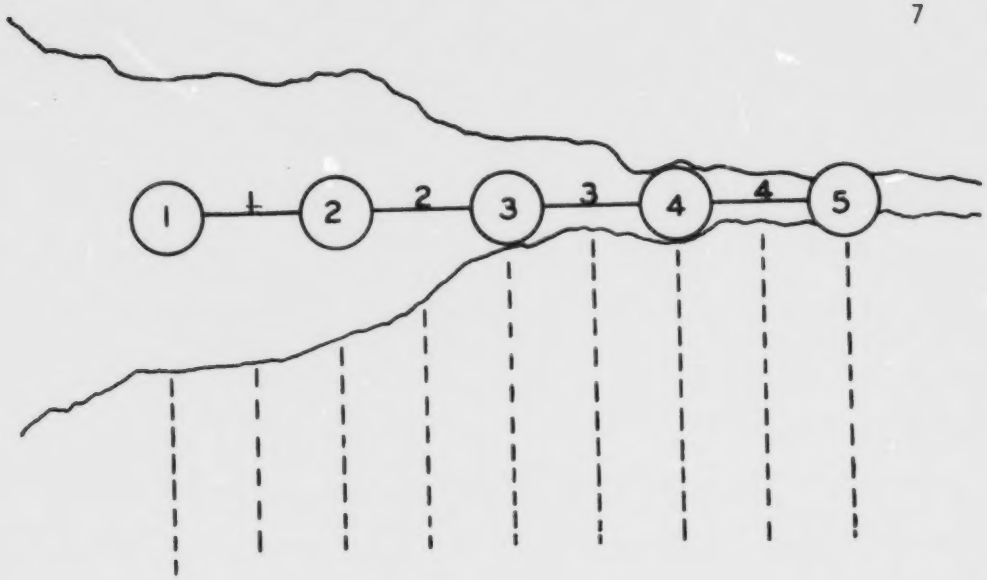
The network shown in Figure 1 would result from the above information.

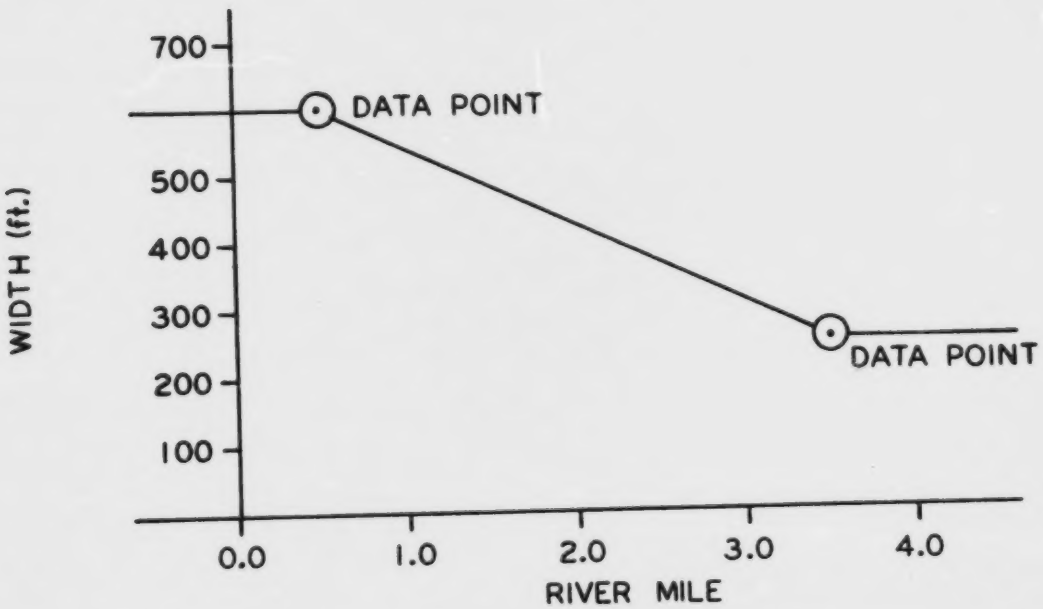
The starting and ending miles are the midpoints of the first and last junctions, respectively. The distance from junction interface to junction interface is equal to the length of the segment (ending mile minus starting mile) divided by the number of sections. This distance is referred to as the channel length. In AUTØSS and AUTØQD the channel lengths are constant throughout the network. The first and last junction will actually extend one-half of a channel length outside the defined segment. The stream and/or estuary being modelled is referred to as the segment, and the term "channel" is used as it pertains to the network.

At this point all that has been done is to define the network, the junction boundaries, and the channel lengths. The physical properties (width, depth, etc.) have not yet been determined. Most of these physical characteristics are read as input to the program. Those values that are not read are computed internally on the basis of data that has been read. The input data for these models is referenced to river miles. Once read the input data is either interpolated to define values over the entire segment, or in the case of point value data (such as inflows) it is assigned to the closest junction.

For example, if in the network shown in Figure 2, widths were read in as follows:

FIGURE 2





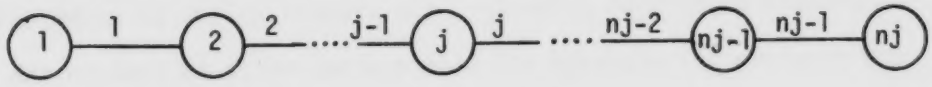
MILE 0.5 - CHANNEL 1; width = 600.0ft.
MILE 1.5 - CHANNEL 2; width = 483.3ft.
MILE 2.5 - CHANNEL 3; width = 366.7ft.
MILE 3.5 - CHANNEL 4; width = 250.0ft.

@ mile 0.5 width = 600.0 ft.

@ mile 3.5 width = 250.0 ft.

The program would assign the values of width as shown in Figure 2. The interpolating procedure, shown in Figure 2, is used for all physical data (see operating instructions for definition of physical data) whether it be a channel or junction parameter.

As a general example of how some of the internal computations on physical data are done, consider the following general network:



let d_j = mean depth of channel j (ft)

As_j = surface area of junction j (ft^2)

W_j = width of channel j (ft)

V_j = volume of junction j (ft^3)

L = channel length (constant)(ft)

W_j is an input to the program, d_j is computed on the basis of flow and L is defined in the network construction. The remaining are computed as follows:

$$As_j = \frac{(W_j + W_{j-1})}{2} L \ (ft^2)$$

$$V_j = \frac{(W_j d_j + W_{j-1} d_{j-1})}{2} L \ (ft^3).$$

The first and last junction's values are given by:

Last junction (nj):

$$As_{nj} = W_{nj-1} L \ (ft^2)$$

$$V_{nj} = W_{nj-1} \ d_{nj-1} L \ (ft^3),$$

First junction (1):

$$As_1 = W_1 \ L \ (ft^2)$$

$$V_1 = W_1 d_1 \ L \ (ft^3).$$

In general, when values are assigned to channels and they are needed to compute a junction parameter, the channel values on either side of the junction are averaged and that average value is used in the computations.

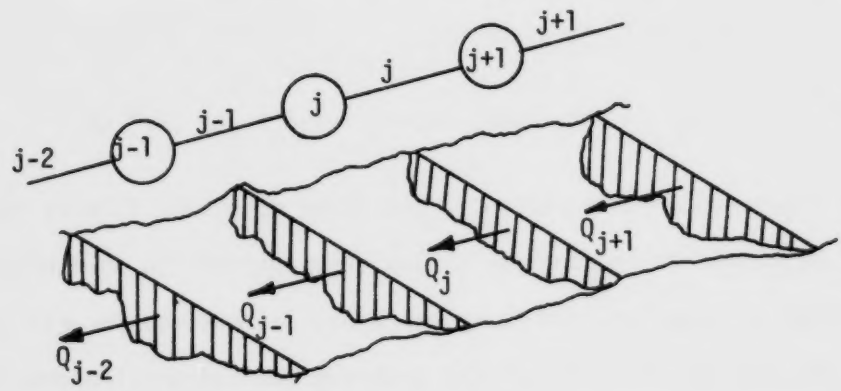
HYDRAULIC DEVELOPMENT:

The hydraulic solution used in AUTOSS and AUTOQD consists of two parts:

1. Determine the flows in each channel.
2. Determine the depths in each channel.

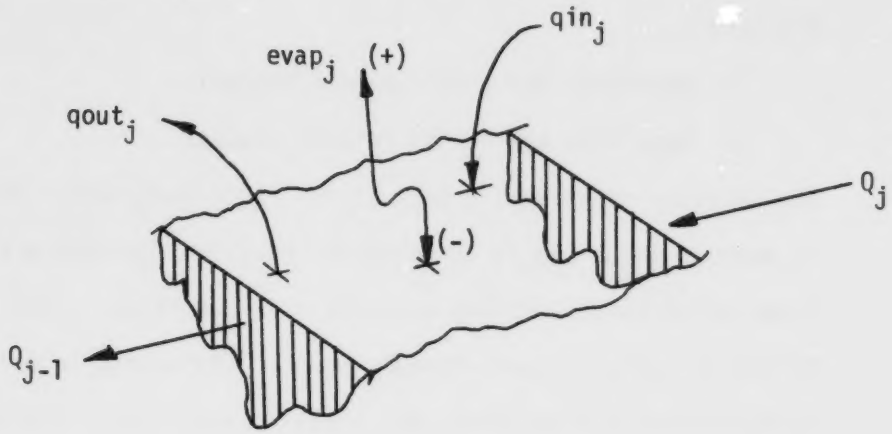
The solution represents a net, steady state situation. No attempt is made in these models to solve the equations governing tidal flow, storm surges, or any unsteady flow condition. That is why AUTOQD is called a quasi-dynamic model. The quality equations are integrated with time using net, steady state flows. The implicit assumption in this approach is that the hydraulic response to changes in flow is instantaneous, while the quality response lags in time. This assumption is acceptable in most instances.

The first part of the solution is a simple application of the principle of continuity. Consider the following situation:



where Q_j = flow rate in channel j (ft^3/sec)

Isolating junction j;



let;

qin_j = inflow to junction j (ft^3/sec)

$qout_j$ = diversion from junction j (ft^3/sec)

$evap_j$ = net evaporation minus rainfall at junction j (inches/month)

CF = conversion factor, to convert in/mo. to ft/sec

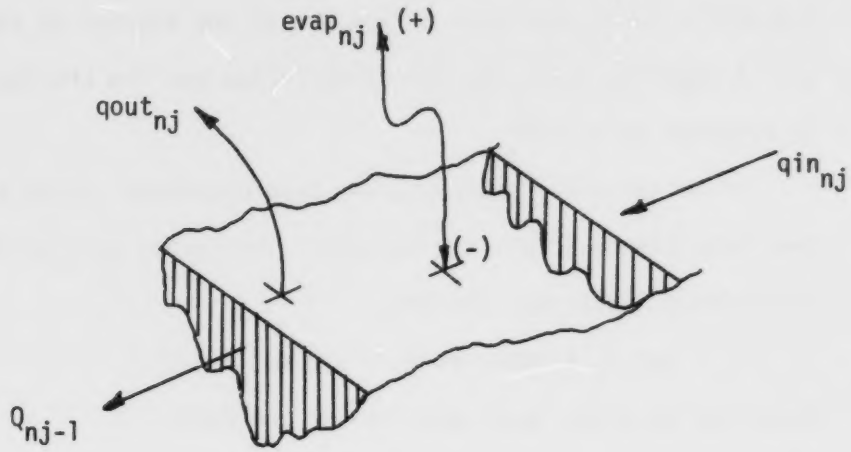
As_j = surface area of junction j (ft^2)

Q_{j-1} will be given by;

(1) $$Q_{j-1} = -Q_j - qin_j + qout_j + evap_j As_j CF \ (ft^3/sec)$$

The signs appear to be wrong in the above equation, this is because the sign convention used is: a flow from upstream to downstream is defined as negative. The above procedure is followed for all channels in the network, starting at the upstream end and working downstream.

However, the first and last junction are computed differently because each has only one channel connected to it. Taking the last junction (nj);

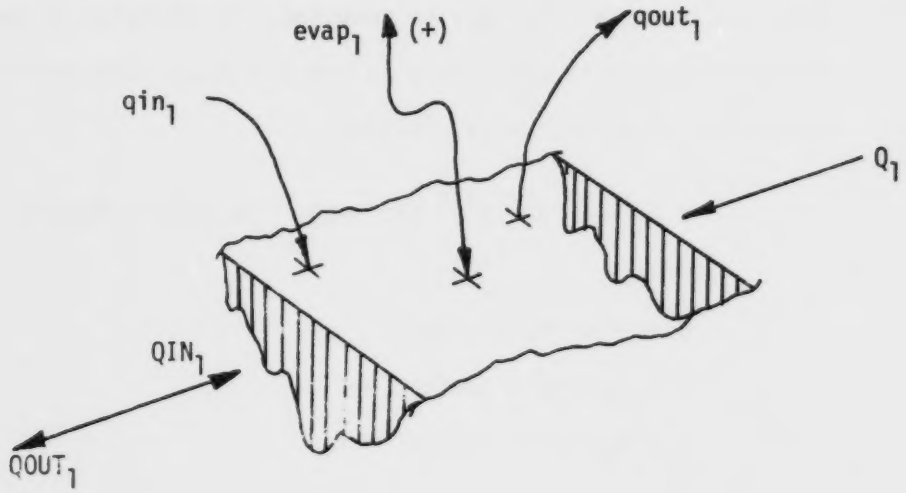


Q_{nj-1} will be given by;

(2) $$Q_{nj-1} = -qin_{nj} + evap_{nj} As_{nj} CF + qout_{nj} \quad (ft^3/sec)$$

(note sign convention)

Taking the first junction (1);



$QOUT_1$ ($-QIN_1$) will be given by;

$$(3) \qquad \underset{(-QIN_1)}{QOUT_1} = -Q_1 + qin_1 - qout_1 - evap_1 As_1 CF \ (ft^3/sec)$$

A positive $QOUT_1$ indicates a flow out of the segment at the downstream end. A negative $QOUT_1$ represents an inflow and its absolute value is referred to as QIN_1.

After the above procedure has been completed, flows will have been established in all the channels. The second part of the solution, determining depths may proceed;

let d_i = mean depth of channel i (ft).

Depth can be given by an equation of the form;

$$(4) \qquad d_i = A_{1,i} Q_i^{A_{2,i}} + A_{3,i}$$

where $A_{1,i}$, $A_{2,i}$, and $A_{3,i}$ are emperical constants.

The coefficients of equation (4) ($A_{1,i}$, $A_{2,i}$, $A_{3,i}$) are entered as point inputs and interpolated over the segment. These coefficients may be determined from stage/discharge curves when availiable. In some special cases they may be computed. For example, assume the Manning Equation is applicable (a special case). The coefficients could then be determined as follows:

$$U = \frac{1.486}{n} R^{2/3} S^{1/2} \ (ft/sec) \qquad \text{Manning's Formula [6]}$$

where;

U = velocity (ft/sec)

n = Manning's coefficient

R = hydraulic radius (ft)

S = water surface slope (ft/ft)

Assume the channel is wide compared to its depth, then R ≈ d. For uniform steady flow S ≈ slope of channel bottom (S_o). Letting B = channel witdh (ft) and Q = flow rate (ft^3/sec), the Manning Formula may be written as;

$$\frac{Q}{Bd} = \frac{1.486}{n} d^2 S_o^{1/2}$$

solving for d,

$$d = \left[\frac{n}{1.486BS_o^{1/2}}\right]^{0.6} Q^{0.6}$$

which corresponds to;

$$d = A_1 Q^{A_2} + A_3$$

with,

$$A_1 = \left[\frac{n}{1.486BS_o^{1/2}}\right]^{0.6}$$

$$A_2 = 0.6$$

$$A_3 = 0.0$$

In an estuary the depth of flow may be essentially invariant with the flow magnitude. In that case A_1 equals 0.0 and A_3 represents the estuary depth at mean tide level.

There has been no distinction made between estuaries and free flowing streams in the hydraulic development. Since the models use daily average or net flows, the hydraulic differences between estuaries and streams may be represented in the coefficients of the depth

equation. It is possible to link together the stream and estuary in these models.

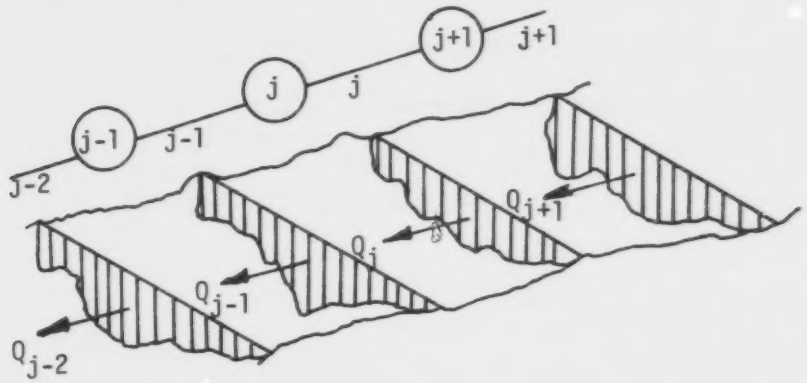
QUALITY DEVELOPMENT

The quality solutions used in AUTØSS and AUTØQD are based on the mass balance equations. A general development is given first and then the equations and solution techniques for AUTØSS and AUTØQD are given separately.

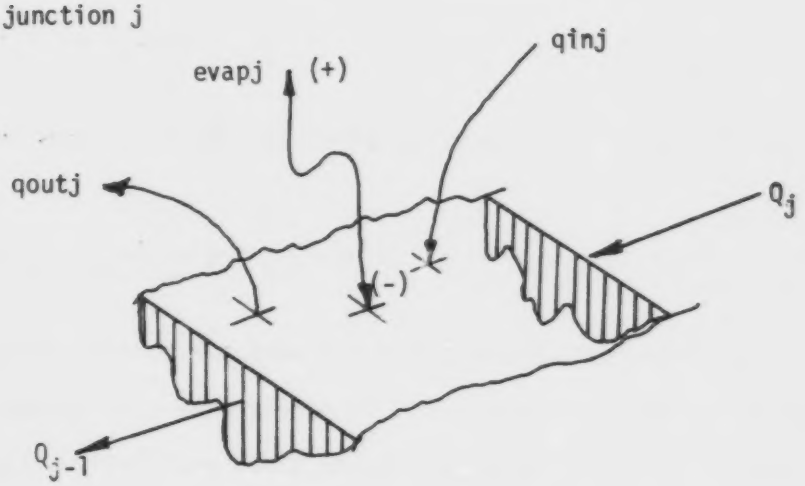
GENERAL QUALITY EQUATIONS:

CONSERVATIVE SUBSTANCES:

Isolating junctions j-1, j, j+1, and channels j+1, j, j-1, j-2



Taking junction j



Let C_j = constituent concentration (ppm) at junction j

C_j-1 = " " " " j-1

C_{j+1} = " " " " j+1

Cin_j = inflow concentration (ppm) at junction j (associated with qin_j)

V_j = volume of junction j (ft^3)

Writing a mass balance for junction j

Mass in (during Δt) = $[Q_j C_{j+1} + qin_j Cin_j]\ \Delta t$(ppm ft^3/sec)

Mass out (during Δt) = $[Q_{j-1} C_j + qout_m C_m]\ \Delta t$(ppm ft^3/sec)

(Note sign convention on flows)

$$\frac{\Delta M_j}{\Delta t} = \text{Mass in - Mass out}$$

$$\frac{\Delta M_j}{\Delta t} = -Q_j C_{j+1} + qin_j Cin_j + Q_{j-1} C_j - qout_j C_j$$

$M_j = V_j C_j$ and

$$\frac{\Delta M_j}{\Delta t} = V_j \frac{\Delta C_j}{\Delta t}$$

(5) $$\frac{\Delta C_j}{\Delta t} = (-Q_j C_{j+1} + qin_j Cin_j + Q_{j-1} C_j - qout_j C_j) / V_j \text{(ppm/sec)}$$

If the flow were in the opposite direction the above equation would appear as:

(6) $$\frac{\Delta C_j}{\Delta t} = (Q_{j-1} C_{j-1} - Q_j C_j - qout_j C_j + qin_j Cin_j) / V_j \text{(ppm/sec)}$$

The flows used in equation 5 are used for further developments. Equations 5 and 6 are applicable to purely advective systems. However, in general there are exchanges due to tidal oscillations (in estuaries)

and/or turbulent dispersion (in estuaries and free flowing streams). These exchanges are not included in equations 5 and 6. To express these changes, an analogy is made with Fourier's law of heat conduction [7]

$$\dot{\delta q} = -k\frac{\partial T}{\partial n}\,\delta A$$

where

$\dot{\delta q}$ = the heat flow across δA (BTU/hr)

δA = elemental cross sectional area (ft^2)

k = thermal conductivity (BTU/°K-ft)

T = absolute temperature (°K)

$\frac{\partial T}{\partial n}$ = derivative of temperature in the direction of the outward normal $\hat{n}$ (averaged over δA).

Integrating over A and considering the x direction

$$\dot{Q} = -kA\,\frac{\partial T}{\partial x}$$

The equation says that the heat transfer per unit time is proportional to the temperature gradient. The analogy is drawn that the mass transfer per unit time is proportional to the concentration gradient.

(7) $$\frac{\partial M}{\partial t} = -EA\,\frac{\partial C}{\partial x}$$

The constant of proportionality (E) is called the dispersion coefficient. It is considered a channel property and is an input parameter. The dispersion coefficient is important in both models, particularly in tical bodies. This feature is now added to the mass balance equation (5):

$$(8)\qquad \frac{\Delta C_j}{\Delta t} = [-Q_j C_{j+1} + Q_{j-1} C_j - qout_j C_j + qin_j Cin_j]/\ V_j$$

$$+[E_j A_j \frac{(C_j - C_{j+1})}{L} + E_{j-1} A_{j-1} \frac{(C_j - C_{j-1})}{L}]/\ V_j \text{(ppm/sec)}$$

where

A_j = cross-sectional area of channel j (ft^2)

E_j = dispersion coefficient in channel j (ft^2/sec)

L = channel length (ft)

If qin and qout are zero and a uniform channel is assumed, the above equation reduces to the familiar form [8]:

$$(9)\qquad \frac{\partial C}{\partial t} = E \frac{\partial^2 C}{\partial x^2} - u \frac{\partial C}{\partial x} \quad (u = \text{velocity})$$

when the limit of $L \to 0$, $L \neq 0$ is taken.

Equation 8 is the basis for the solution of conservative constituents.

NON-CONSERVATIVE SUBSTANCES

The formulation for conservative substances also apply to non-conservative substances, however, the reactions of the substance with the environment and/or other substances must be added.

Three non-conservative substances are considered in these models:

1. CBØD - first stage (carbonaceous) Biochemical Oxygen Demand (BØD)
2. NBØD - second stage (nitrogenous) Biochemical Oxygen Demand (BØD)
3. DØ - Dissolved Oxygen

The oxidation of organic waste will be broken into three stages:

1. Oxidation of oxidizable carbon compounds
2. Oxidation of ammonia (to nitrite)
3. Oxidation of nitrite (to nitrate)

The oxidation of the carbon and nitrogen constituents will be considered separately.

FIRST STAGE OXYGEN DEMAND (CBØD)

Theoretically this term represents the ultimate oxygen demand of the organic carbon compounds, (carbonaceous BØD). It has been reported that this term has a theoretical value of 2.67C [9], where C is the organic carbon content. Realistically, this term represents the oxygen demand of inorganic compounds (chemical oxygen demand) as well as the oxidation of organic waste. To determine its value, various factors have been developed to be applied to 5-day BØD values to obtain the ultimate first stage oxygen demand. These factors may vary from 1.10 to 2.40, with 1.45 being the most common. CBØD may be obtained from BØD values as follows:

Determine the deoxygenation rate K_c (1/day) with no nitrification taking place. Then using BOD_5, again assuming no nitrification. CBØD will be given as:

(10)
$$CB\text{Ø}D = \frac{B\text{Ø}D_5}{(1.0 - e^{-5k_c})}$$

Note that if $K_c = 0.23$ (a common literature value) then $CB\text{Ø}D = 1.45\ B\text{Ø}D_5$.

If $B\emptyset D_n$ is known CBØD would be given as

$$CB\emptyset D = \frac{B\emptyset D_n}{(1.0 - e^{-nkc})} \tag{11}$$

The behavior of CBØD in the natural waterway is described by the first order reaction [10]

$$\frac{\partial CB\emptyset D}{\partial t} = -K_c CB\emptyset D \tag{12}$$

where Kc is the deoxygenation rate in the waterway. The complete equation for CBØD may now be written

let C_j = CBØD concentration in junction j (ppm)

Cin_j = CBØD inflow concentration at junction j (ppm)

$$\frac{\Delta C_j}{\Delta t} = [-Q_j C_{j+1} + Q_{j-1} C_j - qout_j C_j + qin_j Cin_j]/ V_j \tag{13}$$

$$-[\frac{E_j A_j}{L}(C_j - C_{j+1}) + E_{j-1} A_{j-1} \frac{(C_j - C_{j-1})}{L}]/V_j$$

$$-Kc_j C_j$$

The deoxygenation rate Kc_j is the rate in the stream. K_c is entered as input to the program. The value entered is assumed to be the value at 20°C. Stream temperatures are also entered and K_c is then corrected according to the equation [11]

$$K_c @ T°C = (K_c @ 20°C)\ (1.047)^{(T-20)} \tag{14}$$

The oxidation of the organic carbon compounds (CBØD) is assumed to be independent of the dissolved oxygen concentration. This assumption, naturally, limits the application of these models to aerobic systems.

SECOND STAGE OXYGEN DEMAND (NBØD)

This constituent represents the ultimate oxygen demand of all the oxidizable nitrogen fractions. The oxidations of ammonia, nitrite and organic nitrogen are lumped together in this term. Organic nitrogen is included because it is generally assumed that organic nitrogen first hydrolyses to ammonia nitrogen and the oxidation occurs. The ultimate NBØD may be given by [12]

(15) $$NBØD = 4.57\ TKN + 1.14\ (NO_2^- - N)$$

where TKN Is the Total Kjeldahl Nitrogen (Organic N + Ammonia -N) and NO_2^- is nitrite nitrogen. The above relationship assumes that all the TKN and NO_2^- -N is oxidizable. If this is not the case an appropriate reduction factor, as determined by laboratory studies, will have to be applied.

It is assumed that the oxidation of the various nitrogen fractions (referred to as nitrification) can be characterized by one gross rate K_n (1/day). This rate is primarily a function of the nitrifying bacteria populations and temperature. Specifically, Nitrosomonas for the oxidation of ammonia to nitrate and Nitrobacter for the oxidation of nitrite to nitrate. Despite the laboratory BØD test results, it is reasonable, in most cases, to assume that the populations of Nitrosomonas and Nitrobacter are sufficient, in the stream, to bring about significant oxidation of the nitrogen fractions immediately upon their introduction to the natural stream. The nitrification rate K_n is entered as input to the model. A commonly used literature value is 0.103 (1/day). [13] NBØD is handled in the same way as CBØD.

(16) $$\frac{\partial NBØD}{\partial t} = -K_n NBØD$$

The complete equation for NBØD is identical to the one for CBØD except that K_n replaces K_c. As with K_c, K_n is temperature corrected according to the equation [14]

(17) $$K_n@T°C = (K_n@20°C)(1.017)^{T-20}$$

Nitrification is assumed to proceed independently of dissolved oxygen in AUTØSS. In AUTØQD, when DØ drops below 5% of the air saturation value the nitrification rate is set to zero.

DISSOLVED OXYGEN

Dissolved oxygen is the most complex constituent considered. Many factors enter into the DO budget, some of which are well understood, others of which very little is known. Below are the factors in the DØ budget considered here:

Oxygen Gain	Oxygen Loss
1. Atmospheric Reaeration	1. CBØD
2. Photosynthetic Production	2. NBØD
	3. Sediment uptake
	4. Biological respiration
	5. Evaporation

Some of the factors are considered as constant sources or sinks for a particular junction, while others are computed, such as CBØD and NBØD. The DO budget for junction j is written in equation form as:

(18)
$$\frac{\Delta D\emptyset_j}{\Delta t} = [-Q_j D\emptyset_{j+1} + Q_{j-1} D\emptyset_j - qout_j D\emptyset_j + qin_j D\emptyset in_j]/V_j$$
$$-[E_j A_j \frac{(D\emptyset_j - D\emptyset_{j+1})}{L} + E_{j-1} A_{j-1} \frac{(D\emptyset_j - D\emptyset_{j-1})}{L}]/V_j$$
$$-K_{C_j} CB\emptyset D_j - K_{N_j} NB\emptyset D_j + K_{2_j} (D\emptyset sat_j - D\emptyset_j)$$
$$+(P_j - R_j - Sedmt_j) \frac{As_j}{V_j} \cdot CV - evap_j D\emptyset_j CF/V_j$$

where

1. $D\emptyset j$ = dissolved oxygen concentration at junction j (ppm)
2. $D\emptyset in_j$ = dissolved oxygen input concentration at junction j (ppm)
3. $K_{C_j} CB\emptyset D_j$ = the rate of oxygen usage by CBØD
4. $K_{N_j} NB\emptyset D_j$ = the rate of oxygen usage by NBØD
5. $K_{2_j} (D\emptyset sat_j - D\emptyset_j)$ = the rate of the addition of oxygen due to atmospheric reaeration. K_{2_j} (1/day) is the reaeration coefficient for junction j. $D\emptyset sat_j$ is the oxygen saturation concentration in junction j. Both K_{2_j} and/or $D\emptyset sat_j$ may be entered as input or they may be computed within the program. If the computing option is chosen, the following methods are used:

DØsat is computed by the equation [15]

(19)
$$D\emptyset sat_j = 14.62 - 0.367T_j + 0.0045T^2{}_j \text{ (ppm)}$$

where T_j is the water temperature (°C) at junction j.

Note: This equation assumes a salinity of 0.0 parts per thousand. Equation 19 is a simplication of the following equation:

$$D\emptyset sat = 14.6244 - 0.367134T + 0.044972T^2 - 0.0966S + 0.00205ST + 0.0002739S^2$$

where S is the salinity concentration in parts per thousand (°/₀₀). K_2 is computed by the Dobbin's O'Connor equation [16]

(20)
$$K_{2_j} @20°C = \frac{12.9u^{1/2}}{H_j^{3/2}}$$

where H_j = hydraulic radius (ft)

and u_j = velocity (ft/sec)

H_j is assumed to be equal to the depth.

K_2 is computed in the channels and then averaged to obtain junction values.

K_2 is also adjusted for temperature: [17]

(21)
$$K_2@T°C = (K_2 @20°C)(1.024)^{T-20.0}(1/day)$$

With relatively minor program changes, other equations for computing the reaeration rate may be incorporated into the model to replace the above equation. The reader is referred to "Tracer Measurement of Stream Reaeration" [18] and "Characterization of Stream Reaeration Capacity" [19] for information on other methods for determining or computing the reaeration rate.

6. $P_j - R_j$ (Photosynthesis - Respiration Rate) = the net difference between the production of oxygen and the usage of oxygen by biological activity other than CBØD, NBØD and sediment uptake. It is a daily and volume averaged value

and has the units gr. $O_2/m^2/day$. In reality, these terms are difficult to evaluate. The reader is referred to available literature for further information.

7. $Sedmt_j$ = the net oxygen uptake of the sediments. It is entered as input and has the units gr. $O_2/m^2/day$. As with P-R this term is difficult to accurately evaluate. Various literature values have been presented. One method for obtaining field measurements is presented in "An In-Situ Benthic Respirometer." [20]

8. CV and CF are units conversion factors. The other terms in equation 18 have been previously defined.

The dissolved oxygen solution presented here should be viewed as an approximation. For most applications most of the important sources and sinks of oxygen have been accounted for in some form. In many applications the user may find many of the terms may be neglected.

AUTØSS SOLUTION:

For the steady state condition the time derivatives of equations (8),(13) and (18) are set to zero. The quality equations are written as:

1. Conservative Constituents.

$$0 = [-Q_jC_{j+1} + Q_{j-1}C_j - qout_jC_j + qin_jCin_j] / V_j$$

$$-[E_jA_j(\frac{C_j-C_{j+1}}{L}) + E_{j-1}A_{j-1}(\frac{C_j-C_{j-1}}{L})] / V_j \quad (22)$$

2. Carbonaceous Oxygen Demand (CBOD)

$$0 = [-Q_jCBOD_{j+1} + Q_{j-1}CBOD_j - qout_jCBOD_j + qin_jCBODin_j] / V_j$$

$$-[E_jA_j(\frac{CBOD_j-CBOD_{j+1}}{L}) + E_{j-1}A_{j-1}(\frac{CBOD_j-CBOD_{j-1}}{L})] / V_j \quad (23)$$

$$-K_{C_j}CBOD_j$$

3. Nitrogenous Oxygen Demand (NBOD)

$$0 = [-Q_jNBOD_{j+1} + Q_{j-1}NBOD_j - qout_jNBOD_j + qin_jNBODin_j] / V_j$$

$$-[E_jA_j(\frac{NBOD_j-NBOD_{j+1}}{L}) + E_{j-1}A_{j-1}(\frac{NBOD_j-NBOD_{j-1}}{L})] / V_j \quad (24)$$

$$-K_{N_j}NBOD_j$$

4. Dissolved Oxygen (DO)

$$0 = [-Q_jDO_{j+1} + Q_{j-1}DO_j - qout_jDO_j + qin_jDOin_j] / V_j$$

$$-[E_jA_j(\frac{DO_j-DO_{j+1}}{L}) + E_{j-1}A_{j-1}(\frac{DO_j-DO_{j-1}}{L})] / V_j \quad (25)$$

$$-K_{C_j}CBOD_j - K_{N_j}NBOD_j + K_{2_j}(DOsat_j-DO_j) - evap_jCF\cdot DO_j/V_j$$

$$+(P_j-R_j-Sedmt_j)As_jCV/V_j$$

These equations are based on the same flow condition from which equations (8), (13) and (18) were derived. As before, all the remaining derivations are made on the basis of this flow condition. Derivations for the other flow possibilties are left to the reader. The models were designed to handle any flow possibility.

The set of equations for a constituent now appear as a set of linear equations with the junction concentrations as the only unknowns. Taking the conservative equation for junction j and solving for C_j gives;

$$(26) \qquad C_j = -\frac{\alpha_{j,3}}{\beta_j} - \frac{\alpha_{j,1}}{\beta_j} C_{j-1} - \frac{\alpha_{j,2}}{\beta_j} C_{j+1}$$

where;

$$\beta_j = [Q_{j-1} - qout_j - E_jA_j/L - E_{j-1}A_{j-1}/L]$$

$$\alpha_{j,1} = E_{j-1}A_{j-1}/L$$

$$\alpha_{j,2} = -Q_j + E_jA_j/L$$

$$\alpha_{j,3} = qin_jCin_j$$

The coefficients for the first and last junction are:

Last junction (nj);

$$\beta_{nj} = -qout_{nj} - E_{nj-1}A_{nj-1}/L + Q_{nj-1}$$

$$\alpha_{nj,1} = E_{nj-1}A_{nj-1}/L$$

$$\alpha_{nj,2} = 0$$

$$\alpha_{nj,3} = qin_{nj}Cin_{nj}$$

First junction (1);

$$\beta_1 = -qout_1 - E_1A_1/L$$

$$\alpha_{1,1} = 0$$

$$\alpha_{1,2} = E_1A_1/L + Q_1$$

$$\alpha_{1,3} = qin_1 Cin_1$$

The equations for the first and last junction are written as;

$$(27) \qquad C_1 = -\frac{\alpha_{1,3}}{\beta_1} - \frac{\alpha_{1,2}}{\beta_1} C_2$$

$$(28) \qquad C_{nj} = -\frac{\alpha_{nj,3}}{\beta_{nj}} - \frac{\alpha_{nj,1}}{\beta_{nj}} C_{nj-1}$$

The coefficients for the other constituents are determined in the same manner as for the conservative constituents.

The basic solution technique used in AUTØSS is called the "Gauss-Seidel Iterative Method"[21]. A relaxation factor has been added to the method to increase or decrease the rate of change. The algorithm for this method is decribed as follows:

Given the system of equations;

$$C_1 = -\frac{\alpha_{1,3}}{\beta_1} - \frac{\alpha_{1,2}}{\beta_1} C_2$$

$$C_2 = -\frac{\alpha_{2,3}}{\beta_2} - \frac{\alpha_{2,1}}{\beta_2} C_1 - \frac{\alpha_{2,2}}{\beta_2} C_3$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$C_j = -\frac{\alpha_{j,3}}{\beta_j} - \frac{\alpha_{j,1}}{\beta_j} C_{j-1} - \frac{\alpha_{j,2}}{\beta_j} C_{j+1}$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$C_{nj} = -\frac{\alpha_{nj,3}}{\beta_{nj}} - \frac{\alpha_{nj,1}}{\beta_{nj}} C_{nj-1}$$

1. Assign initial values to the junction concentrations, these

values are approximations.

2. Starting at the first junction, compute a new concentration. Compute the difference between the old and new concentration;

$$\delta_C = C_{j,new} - C_{j,old}$$

Compute and store the new concentrations as;

$$C_j = C_{j,old} + \omega\delta_C$$

where ω is a relaxation factor.

Repeat this procedure for junctions 2, 3, 4, ..., nj.

3. If all the δ_C's computed in step 2 are within a specified limit (convergence criteria) then the solution is complete, if not, return to step 2 and repeat. Every time step 2 is repeated it is referred to as an iteration. The maximum number of iterations has been set at 1000 (see MAXCYC in Subroutine SØLVEX), this value may be changed by the user, if desired. The convergence criteria and ω have been set at 0.001 and 1.00 respectively (see DELMAX and RELAX in SØLVEX), these may also be changed.

AUTØQD SOLUTION:

The AUTØQD solution is naturally more complex than the steady state solution. The equations to be solved are essentially the same as those derived in the basic development, except they are left in terms of mass changes:

1. Conservative Constituents

$$\frac{\Delta M_j}{\Delta t} = -Q_j C_{j+1} + qin_j Cin_j + Q_{j-1} C_j - qout_j C_j - E_j A_j \left(\frac{C_j - C_{j+1}}{L}\right) - E_{j-1} A_{j-1} \left(\frac{C_j - C_{j-1}}{L}\right) \quad (29)$$

2. Carbonaceous Oxygen Demand (CBOD)

$$\frac{\Delta M_j}{\Delta t} = -Q_j CBOD_{j+1} + qin_j CBODin_j + Q_{j-1} CBOD_j - qout_j CBOD_j - E_j A_j \left(\frac{CBOD_j - CBOD_{j+1}}{L}\right) - E_{j-1} A_{j-1} \left(\frac{CBOD_j - CBOD_{j-1}}{L}\right) - K_{C_j} CBOD_j V_j \quad (30)$$

3. Nitrogenous Oxygen Demand (NBOD)

$$\frac{\Delta M_j}{\Delta t} = -Q_j NBOD_{j+1} + qin_j NBODin_j + Q_{j-1} NBOD_j - qout_j NBOD_j - E_j A_j \left(\frac{NBOD_j - NBOD_{j+1}}{L}\right) - E_{j-1} A_{j-1} \left(\frac{NBOD_j - NBOD_{j-1}}{L}\right) - K_{N_j} NBOD_j V_j \quad (31)$$

4. Dissolved Oxygen (DO)

$$\frac{\Delta M_j}{\Delta t} = -Q_j DO_{j+1} + Q_{j-1} DO_j - qout_j DO_j + qin_j DOin_j \quad (32)$$

$$-E_j A_j \left(\frac{DO_j - DO_{j+1}}{L}\right) - E_{j-1} A_{j-1} \left(\frac{DO_j - DO_{j-1}}{L}\right)$$

$$-K_{C_j} CBOD_j V_j - K_{N_j} NBOD_j V_j + K_{2_j} (DOsat_j - DO_j) V_j$$

$$+(P_j - R_j - Sedmt_j) As_j CV - evap_j DO_j CF$$

The method of integrating these equations may be called a modified Euler Predictor-Corrector Method [22]. A simplified example of the method is:

Given;

$$\frac{dy}{dx} = f(x,y)$$

let

$$\Delta = x_{n+1} - x_n$$

then,

$$y_{n+1/2} = y_n + \frac{\Delta}{2} [f(x_n, y_n)]$$

and,

$$y_{n+1} = y_n + \frac{\Delta}{2} [\, f(x_{n+1/2}, y_{n+1/2}) + f(x_n, y_n) \,]$$

To demonstrate how this procedure is done in the program, consider the CBOD, NBOD and DO equations. In AUTØQD, CBOD and NBOD must be solved for concurrently with DO to yield a solution.

Given initial conditions $CBOD_j^o$, $NBOD_j^o$, and DO_j^o and an integration step Δt;

1. Compute initial constituent masses at each junction;

$$CMAS_j^o = CBOD_j^o V_j$$

$$NMAS_j^o = NBOD_j^o V_j$$

$$OMAS_j^o = DO_j^o V_j$$

2. Compute and store mass slopes at time t;

$$\frac{\Delta CMAS_j}{\Delta t} = [\text{equation (30)}] = SC_1$$

$$\frac{\Delta NMAS_j}{\Delta t} = [\text{equation (31)}] = SN_1$$

$$\frac{\Delta OMAS_j}{\Delta t} = [\text{equation (32)}] = SO_1$$

3. Compute new junction concentrations at time $t + \Delta t/2$;

$$CBOD_j^{+1/2} = [SC_1(\Delta t/2) + CMAS_j^o] / V_j$$

$$NBOD_j^{+1/2} = [SN_1(\Delta t/2) + NMAS_j^o] / V_j$$

$$DO_j^{+1/2} = [SO_1(\Delta t/2) + OMAS_j^o] / V_j$$

4. Using concentrations computed in step 3, compute new mass slopes;

   SC_2, SN_2, and SO_2

5. Average mass slopes at times t and $t + \Delta t/2$;

   $SC = [SC_1 + SC_2] / 2$

   $SN = [SN_1 + SN_2] / 2$

   $SO = [SO_1 + SO_2] / 2$

6. Compute new masses and concentrations at time $t + \Delta t$;

$$CMAS_j^1 = CMAS_j^o + SC\Delta t$$

$$NMAS_j^1 = NMAS_j^o + SN\Delta t$$

$$OMAS_j^1 = OMAS_j^o + SO\Delta t$$

$$CBOD_j^1 = CMAS_j^1 / V_j$$

$$NBOD_j^1 = NMAS_j^1 / V_j$$

$$DO_j^1 = OMAS_j^1 / V_j$$

7. Return to step 2, and repeat until run is complete.

The integration method is the same as the above for all the constituents.

As with many integration schemes the problem of instability can arise. The time step (Δt) is the most sensitive parameter in the solution. A time step that is too small will increase the operation cost and also increase numerical mixing. One that is too large will result in instabilities in the solution. The most stable time step to use is;

(33) $$\Delta t \leqq [\ L/u\ ]_{minimum}$$

where; Δt = time step (secs)

L = channel length (ft)

u = channel velocity (tidal in estuaries and net in free flowing streams) (ft/sec)

The time step as determined above will not necessarily be the same for all channels.

The program will compute its own time step based on the above equation. The user may bypass this option and specify the time interval if desired. In some cases, the user may have to experiment to find the best time step.

APPENDIX A

AUTØSS - PROGRAM DESCRIPTION/OPERATING INSTRUCTIONS

GENERAL:

Program AUTØSS is written in ANSI FORTRAN and has been successfully run on the IBM 370 operating system (NIH - Bethesda, Maryland). The program requires no input/output devices other than a card reader and line printer. The read and write unit numbers are presently set at 1 and 6 respectively. These are variable and may be easily changed (see program listing--Main program, variables NRD & NWR). Machine storage requirement is 105K. A typical running time is 1.1 secs. (compute time) per steady state solution with 150 sections. These times and their respective costs will vary with the computer used and the network used.

The program is written in a modular framework. This type of program construction is easy to understand and facilitates changes. The user has a wide degree of flexibility in the use of the program because of its construction and the input setup. It is possible to make multi-problem solutions within the same computer run.

PROGRAM LOGIC:

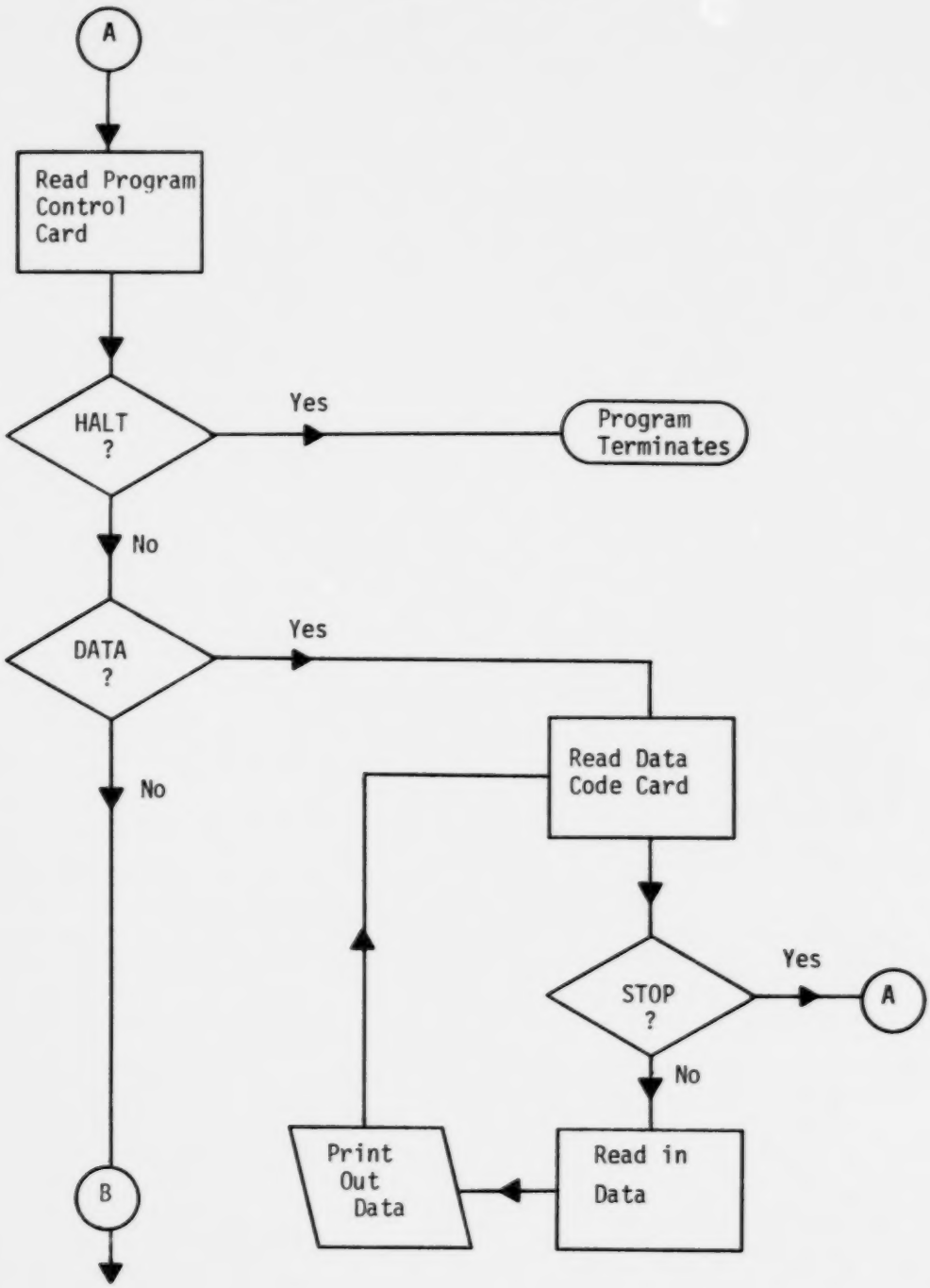
The program is controlled by the use of "program control cards". These cards are read as input and consist of a word code, starting in column 1, punched on the card. Each control card causes the program to execute some function. Usually data cards follow each program

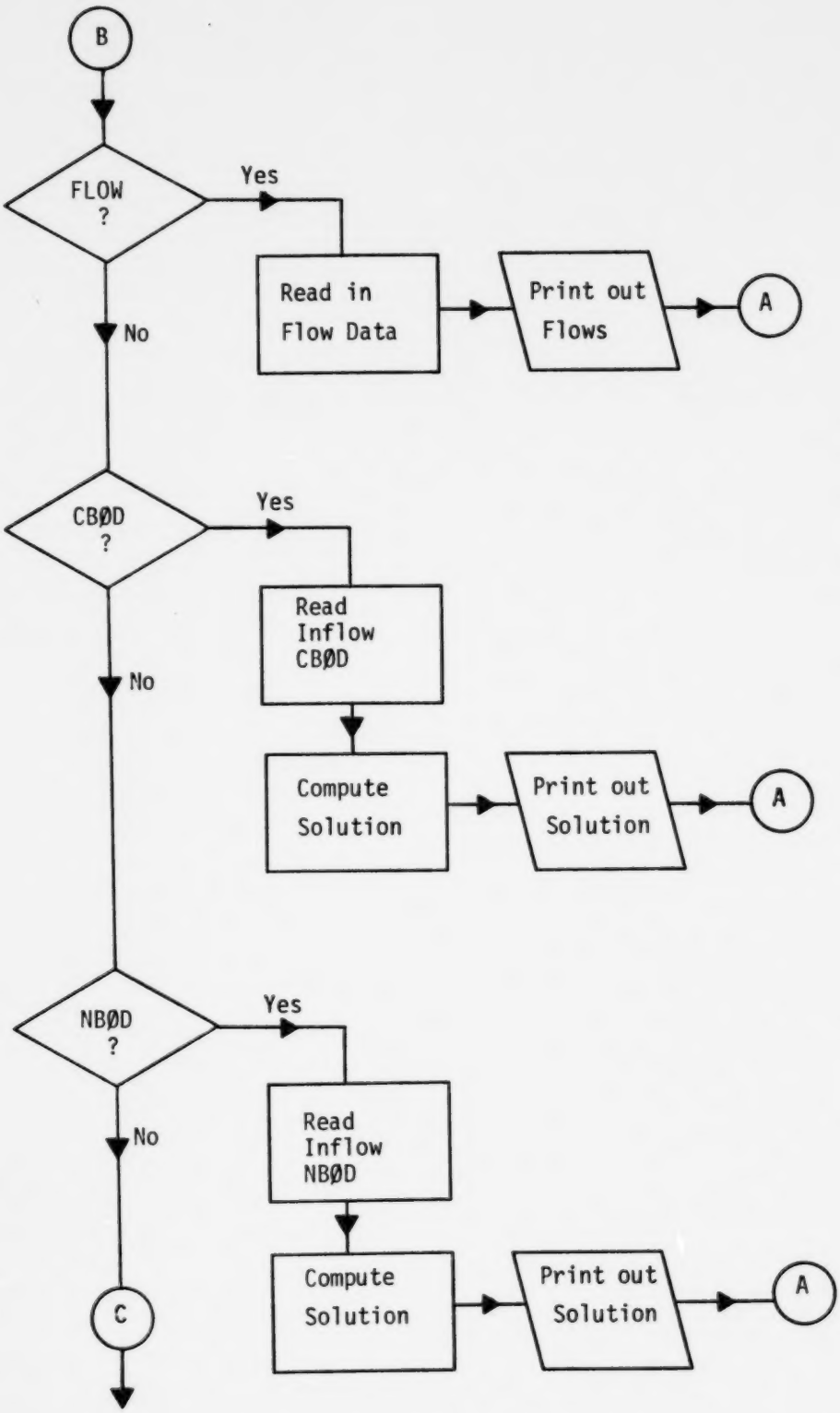
control card. The program control cards and their respective functions are as follows:

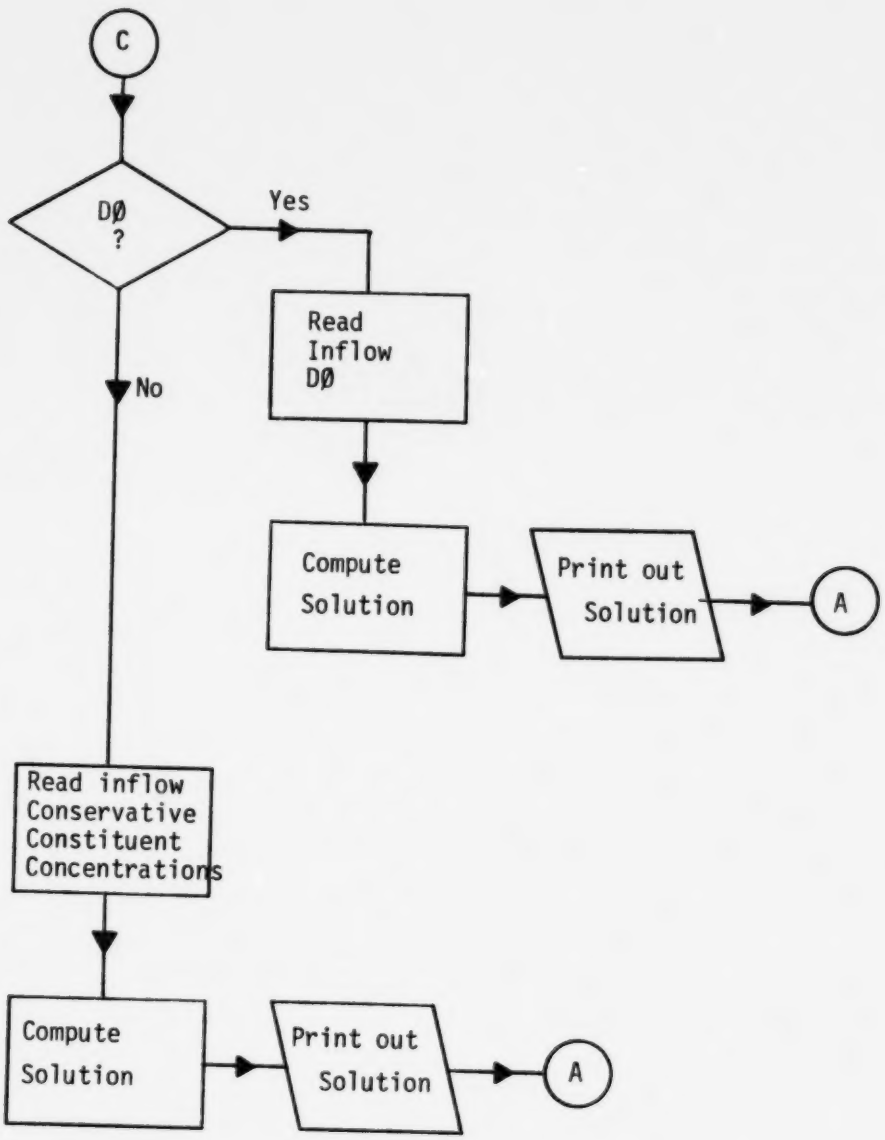
Program Control Card (Columns 1 thru 4)	Function
DATA	Directs the program to read in or replace existing physical data. Data cards follow.
FLØW	Directs the program to read in flow data, and compute flow related physical constants. Data cards follow.
CBØD	Directs the program to read inflow CBØD and then to compute the steady state CBØD concentrations. Data cards follow.
NBØD	Directs the program to read inflow NBØD and then compute the steady state concentrations. Data cards follow.
DØ	Directs the program to read inflow DØ and then compute the steady state concentrations based on the previously run CBØD and NBØD concentrations (if any). Data cards follow.
HALT	Tells the program the run is complete. Program terminates. No data cards follow.
Any four letter word except one of the above	The program assumes this is the name of a conservative constituent. The program reads the inflow concentrations and then computes the steady state concentrations. Data cards follow.

These cards are the basis for the program operation. Through their proper use it is possible to run any number of problems under any number of different conditions within one computer run. Following is a flow chart showing how these cards are handled in the program:

AUTØSS - GENERAL FLOW CHART




B
FLOW ?
Yes
No
Read in Flow Data
Print out Flows
A
CBØD ?
Yes
No
Read Inflow CBØD
Compute Solution
Print out Solution
A
NBØD ?
Yes
No
Read Inflow NBØD
Compute Solution
Print out Solution
A
C


C
DØ ?
Yes
No
Read Inflow DØ
Compute Solution
Print out Solution
A
Read inflow Conservative Constituent Concentrations
Compute Solution
Print out Solution
A

DATA DESCRIPTION

The data for AUTØSS are all referenced to river miles (statute). The channel section being modelled is described by a beginning downstream and ending upstream mile. The input data for the program is divided into physical data and computational data. For physical data the values are read in (at river mile X, the parameter has a value Y) and are interpolated to assign values over the entire river section. If a parameter is constant over the river section only one value at any river mile need be read in. Computational data input values are also referenced to river miles. However, they are not interpolated since they are considered point values. The program may move them slightly or in some cases combine them to conform to the channel-junction concept used in the model. It is important to keep in mind that input data will be interpolated linearly between points, and sufficient physical data points should be entered to adequately define the channel geometry.

The physical data associated with the stream and/or estuary being modelled can be assembled without regard to the starting mile and ending mile that define the section. A data deck describing an entire river length may be prepared and used in AUTØSS even if only very small portions are to be studied in any particular run.

Physical Data:

The following is a list of the parameters that may be entered. These values are entered under the program control card "DATA":

1. A1, A2 and A3: The coefficients for the depth of flow equation ($d=a_1 Q^{a_2} + a_3$). They may take on different

meanings depending on the nature of the channel being modelled. (See model development.)

2. Width (ft): The channel width. Width is assumed to be independent of depth. Average widths for the flow condition to be run should be entered. For instance, in the case of estuaries one would usually enter the width at mean tide level.
3. Tidal Velocities (ft/sec): The average tidal velocity (regardless of direction). These values are usually only entered in the case of estuaries. If a fall line is specified, the program sets the tidal velocities to zero above that point, regardless of what is entered. Velocities are used only to compute the reaeration rates (if that option is selected). If no tidal velocities are specified, or they are zero, the net velocity is computed in the flow computations.
4. Water Temperatures (C°): The average water temperatures for the condition being run. If no values are entered, the temperature is assigned a constant value of 20°C. Water temperatures are used to adjust the various rates and to compute the saturation dissolved oxygen concentrations (if that option is selected).
5. Evaporation - Rainfall (in/month): The net (evaporation - rainfall) for the period being modelled. A rainfall is negative, while an evaporation is positive.

6. (Photosynthesis - Respiration Rate) ($gr.O_2/m^2/day$): This represents the net production or usage of dissolved oxygen by biological activity, (excluding CBØD, NBØD, and sediment demand). Many meanings can be attached to this value. For instance, it may represent algal decay downstream from a bloom. This value represents a 24-hr. average and is not temperature corrected.
7. Oxygen Uptake of Sediments ($gr.O_2/m^2/day$): The net usage rate of oxygen by the sediments. It may also be used to represent a non-point source oxygen demand. This value is not temperature corrected.
8. Dispersion Coefficients (ft^2/sec): One of the most important parameters in estuaries. Tidal mixing is represented with this term since net flows are used. In tidal bodies it may have values as high as 6000 (ft^2/sec). In free flowing systems it is generally much lower, 100 (ft^2/sec). These values are determined by the user.
9. CBØD Decay Rates (1/day): The first stage (carbonaceous) BOD decay rate or deoxygenation rate. The program assumes the value entered is for 20°C, and the rate is corrected to the specified temperatures according to the equation: $K_C@T=(K_C@20°C)(1.047)^{(T-20)}$. Note that if no value is entered for temperature the entered K_C rates will remain unchanged because temperature defaults to 20°C. If it is desired to change the temperature during a run and

correspondingly change the rates, it is necessary to enter both temperature and the rate again.

10. NBØD Decay Rate (1/day): The second stage (nitrogenous) BOD decay rate or deoxygenation rate. It is handled the same way as the CBØD rate except its temperature correction equation is given as:
$(K_n @ T°C) = (K_n @ 20°C)(1.017)^{(T-20)}$

11. Reaeration Rate (1/day): This term represents the atmospheric reaeration rate. It is handled the same way as the CBØD and NBØD decay rates except its temperature correction equation is given as:
$(K_2 @ T°C) = (K_2 @ 20°C)(1.024)^{(T-20)}$.
The user may choose to have this rate computed by the Dobbin's-O'Connor formula. If this rate is to be computed in the program and it is desired to change the temperature and correspondingly the computed rate, it is necessary to enter the flow condition again as well as the temperature.

12. Oxygen Saturation Concentration (ppm): The saturation concentration of oxygen for the conditions being run. An option is available to have this computed by the equation:
$DO_{sat} = 14.62 - 0.367T + 0.0045T^2$
where T is the temperature (°C)

13. Initial Dissolved Oxygen (ppm): The initial estimate of the DO concentrations. It is not necessary to have values here to obtain a solution, but reasonable initial estimates

will allow the solution to converge more rapidly.

14. Initial CBØD Concentrations (ppm).
15. Initial NBØD Concentrations (ppm).
16. Initial Conservative Constituent Concentrations (ppm). The program will only handle one set of initial concentrations for a conservative parameter at one time. If more than one conservative constituent is to be run it will be necessary to enter initial concentrations for each constituent successively. If this is not done the initial concentrations will remain the same (a possible alternative in some cases).

Some parameters are computed on the basis of the above inputs. Junction surface areas are computed using the width input and section lengths. When the flows are entered the depths and velocities (for non-tidal areas) are computed as well as cross-sectional areas, junction volumes and reaeration coefficient (when the compute option is used).

Computational Data:

Under this category the following data are read in:

1. Inflows and flow diversions (cfs).
2. Inflow concentrations (input concentrations) of the particular constituent to be run (ppm).
3. Boundary conditions (constituent concentrations at fixed points)(ppm).

Network Data:

The data required to establish the computational network (channels and junctions) is as follows:

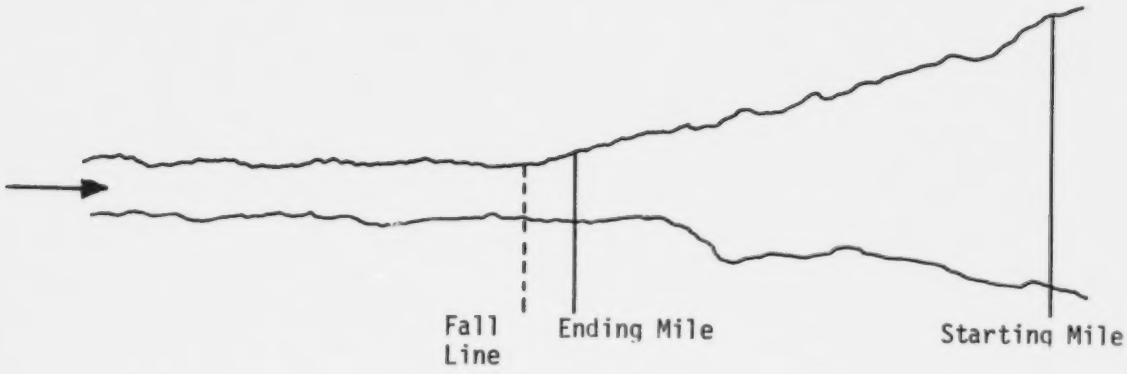
1. Starting river mile.
2. Ending river mile.
3. River mile of fall line.
4. Number of sections.

The fall line is the point above which there is little or no tidal action. When an estuary is being modelled the fall line will be at or above the ending river mile, otherwise the tidal velocities which are entered will be zeroed above it. When a combination of an estuarine and a free flowing system is being modelled the fall line will lie somewhere in between the starting and ending mile. When a free flowing system is being modelled the fall line will be at the starting mile or below it (See Figure A1). The fall line is important since entered tidal velocities will take precedence over the computed net velocities downstream of the fall line. Since velocities are only used in the reaeration rate computation, if the reaeration rate is entered rather than computed it is unimportant where the fall line is placed.

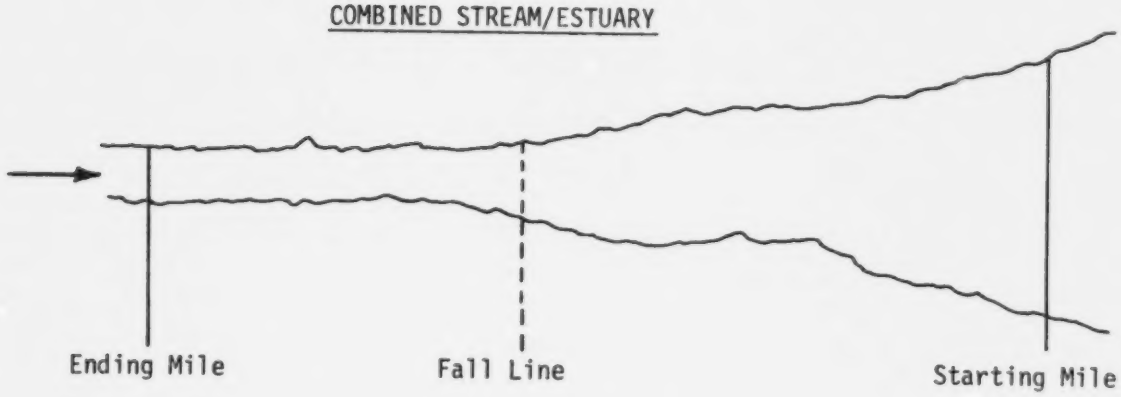
The starting and ending river miles of the section being modelled are self explanatory. The number of sections determines the number of channels and junctions in the network. The maximum number of sections as programmed is 249. The length of the segment is divided by the number of sections. The points along the channel separated by this length represent the midpoints of the junctions. Thus if 10 sections are specified there will be 11 junctions and 10 channels in the network.

FIGURE A1

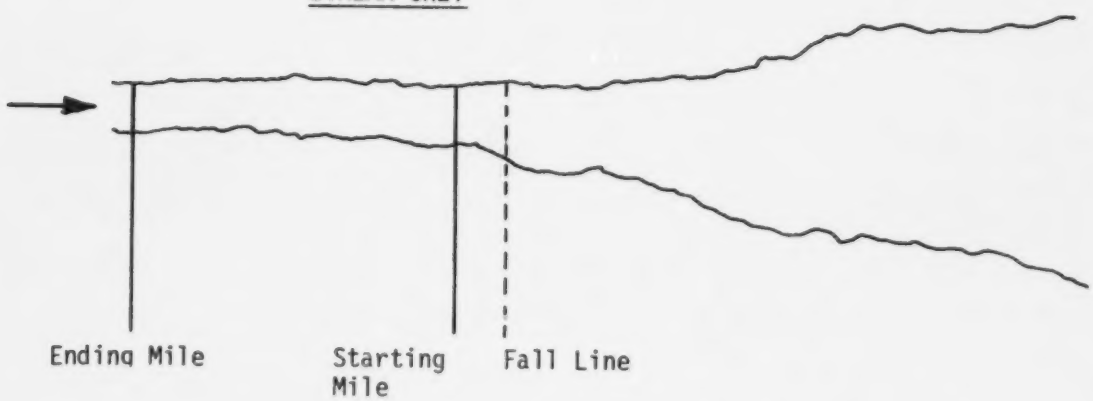
ESTUARY ONLY



COMBINED STREAM/ESTUARY



STREAM ONLY



ENTERING DATA

All data is entered under the direction of a program control card except the run title and network data. Before any variables are entered or computed they are set to default values. It should also be noted that once a variable is entered or computed it will retain that value until it is re-entered or recomputed, except CBØD and NBØD which are zeroed after each DO run.

I. Run Title Card

1. The first card of the data deck. On this card is punched a title or description of the run being made. (Cols. 1-80)

II. Network Card

1. The second card of the data deck. Its format is:

Starting River Mile	- cols. 1-10, include a decimal point
Ending River Mile	- cols. 11-20, include a decimal point
Mile of Fall Line	- cols. 21-30, include a decimal point
No. of Sections	- cols. 31-40 (Right hand justify), no decimal point

III. Entering Physical Data

1. The program control card DATA precedes the data cards.
2. The next card will contain the type of data (see data codes) being entered and the number of cards to be entered with this data. The format for this card is:

Data code - starting in col. 1 (Left hand justify)

No. of data points - cols 12-15 (Right hand justify, no decimal point)

3. Next are the actual data cards; there has to be exactly the number of cards as specified on the data code card. The format for these cards is:

Card no.	- cols. 1- 5 (Right hand justify, no decimal point)
River mile of data point	- cols. 11-20 (include a decimal point)
Parameter value	- cols. 21-30 (include a decimal point)

4. If other physical data are to be entered repeat steps 2 and 3. There is no required order for entering physical data. If no other physical data is to be entered, a card with the word STØP punched in the first 4 columns, is placed in the deck.

IV. Entering Computational Data

A. Flows

1. The program control card FLØW precedes the data cards.

2. Next are the data cards in the following format:

River mile of data point	- cols. 11-20 (include a decimal point)
Inflow (cfs)	- cols. 21-30 (include a decimal point)
Diversion (cfs)	- cols. 31-40 (include a decimal point

3. After the data cards, a card with STØP punched in the first 4 columns is placed in the deck.

B. Carbonaceous Oxygen Demand (CBØD)

1. The program control card CBØD precedes the data cards.
2. Next are the data cards in the following format:

   Note: If it is desired to fix (establish a boundary condition) the concentration of a point, the word FIXED is punched in the first 5 columns of that data card, otherwise these columns are left blank.

   River mile of data point - cols. 11-20 (include a decimal point)

   Inflow at data point - cols. 21-30 (include a decimal point)

   Inflow concentration - cols. 31-40 (include a decimal point)

   Fixed concentration at data point (if desired) - cols. 41-50 (include a decimal point)

3. After all data cards are entered a card with STØP punched in the first 4 columns is placed in the deck.

   Note: If the river concentration at a point other than an inflow point is to be fixed the corresponding inflow simply has a value of zero at that point.

C. Nitrogenous Oxygen Demand (NBOØ)

1. The program control card NBØD precedes the data cards.
2. Next are the data cards, the format and procedure are the same as for CBØD.

D. Dissolved Oxygen (DØ)

1. The program control card DØ precedes the data cards.
2. Next are the data cards, the format and procedure is the same as for CBØD.

E. Conservative constituents

1. The program control card with the constituent name precedes the data card.
2. Next are the data cards, the format and procedure is the same as for CBØD.

After all the data has been entered the HALT program control card is placed in the deck.

OUTPUT DESCRIPTION

The output for AUTØSS is controlled by the program control cards. The output is referenced to river miles as well as channel or junction numbers, depending on the variables.

The first output in a run is the title and a listing of the general network data. Included is the run title, mile of upstream end, mile of downstream end, mile of fall line, and the number of sections.

Each time physical data is entered the data is printed out under the heading "Estuary/Stream Data".

When a flow condition is entered two groups of information are printed. Under the heading "Depth or Velocity Dependent Variables" are printed:

1. Cross-sectional areas
2. Channel depths
3. Channel velocities (tidal or net)
4. Junction volumes
5. Computed reaeration rates (if this option was chosen)

Under the heading "Steady State Flow Conditions" the inflows, diversions, and channel flows are printed. Channel flows may have a negative sign due to the sign convention used. Again, a flow from upstream to downstream is defined as negative.

When a constituent control card is encountered, two other groups are printed. Under the heading of "Steady State (Constituent Name) Input Values" the inflow concentrations are printed. Under the heading of the program title card and the constituent name, the steady state concentrations are printed and a graph of the concentrations versus river mile is plotted.

In addition to the regular output just discussed, there are a number of error statements the program may issue. These are printed only if mistakes were made in entering data. They are:

1. DATA CODE (----) DOES NOT EXIST - PROGRAM TERMINATES
   This can occur when inputing physical data. An undefined data code has been entered, the program terminates.
   User action: Correct mispunched card or misordered deck.
2. AN INFLOW WAS READ IN AT JUNCTION (---) (RIVER MILE XX.XX) IN THE QUALITY INPUT, BUT NOT IN THE HYDRAULIC INPUT, PROGRAM TERMINATES.

This message is self explanatory.

User action: Check inflows and quality inputs for correspondence and correct errors.

3. ZERO DIVIDE AT JUNCTION (---)

A divisor formed in the steady state equations is zero. This occurs when insufficient data has been entered or the flow solution has determined that a junction has no flow entering or leaving and dispersion in the surrounding channels is zero and the decay rate or volume is zero.

User action: Check run data for completeness.

4. ZERO DIVISOR IN (Constituent Name) SOLUTION MATRIX - PROGRAM TERMINATES

This follows message 3 and tells you which constituent has the zero.

User action: see #3.

5. ZERO AREA IN CHANNEL (----)

DEPTH OR WIDTH IS ZERO PROGRAM TERMINATES

This error occurs when the channel cross-sectional area, as computed using width and depth of flow is zero Channel widths have been entered incorrectly or a channel flow was zero and the A_3 flow equation coefficient was also zero.

User action: Check channel flows and flow equation coefficients. Check that widths have been properly entered.

DATA CODE FOR PHYSICAL DATA

CODE (starting in col. 1)	DATA TYPE
A1, A2, A3	The coefficients for the flow equation
WIDTH	Channel widths (ft)
VELØ	Tidal velocities (ft/sec)
EVAP	Net evaporation - rainfall (in/mo)
PHØTØ	Net photosynthesis - respiration rate ($gr.O_2/m^2/day$)
SEDI	Oxygen uptake rate of sediments ($gr.O_2/m^2/day$)
DISP	Dispersion coefficients (ft^2/sec)
CDECAY	CBOD decay rate (1/day)
NDECAY	NBOD decay rate (1/day)
REAER	Reaeration rates (1/day)
SATDØ	Oxygen saturation concentration (ppm)
INITCBØD	Initial CBOD concentrations (ppm)
INITNBØD	Initial NBOD concentrations (ppm)
INITDØ	Initial DO concentrations (ppm)
INIT (4 letter word of conservative parameter)	Initial conservative concentrations (ppm)
C-SATDØ	Instructs the program to compute saturation DØ concentrations, no data cards follow
C-REAER	Instructs the program to compute the reaeration rates, no data cards follow

RUNNING TIPS

The purpose of this section is to bring together and clarify the operating procedure for AUTØSS. The example presented at the end of this appendix should also serve to clarify any remaining questions.

As already stated, the program control cards direct the program to do some function. Generally these cards act independently of each other; however, some general rules should be followed:

1. DATA should be the first control card in the deck. This is because the other control cards (except HALT) use physical data of some kind in their respective functions. DATA may be called again later in the deck to either add or replace physical data.
2. FLOW should be the second control card. This is because the quality control cards use flows and values computed using flow in their functions.
3. CBØD and/or NBØD should be run before DØ if it is desired to consider their effects on the DØ budget. If only CBØD or NBØD are to be considered only that constituent would be run before DØ.
4. Subject to the above general rules the control cards may be arranged in any desired order to yield the desired solution(s).

A general example of the control and setup is given below to demonstrate these principles (see the end of this appendix for a specific example problem).

Problem Statement:

Run TDS, CBØD and DØ under flow condition 1, then run CBØD, NBØD and DØ under flow condition 2, then change the water temperatures (and, correspondingly, the decay rates) and run CBØD, NBØD and DØ under flow condition 3.

The arrangement of the control cards would be:

Enter basic data - DATA - enter original physical data

Solution 1
- FLOW - enter flow condition 1
- TDS - enter inflow TDS and boundary conditions - compute solution
- CBØD - enter inflow CBØD and boundary conditions - compute solution
- DØ - enter inflow DØ and boundary conditions - compute solution

Solution 2
- FLOW - enter flow condition 2
- CBØD - enter inflow CBØD (these may be different than the first time)
- NBØD - enter inflow NBØD
- DØ - enter inflow DØ

Change basic data - DATA - enter new temperature and also enter decay rates and all other temperature dependent variables

Solution 3
- FLOW - enter flow condition 3
- CBOØ - enter inflow CBØD
- NBØD - enter inflow NBØD
- DØ - enter inflow DØ

HALT

Variable	Definition
A(N)	cross-sectional area of channel N
A1(N) A2(N) A3(N)	flow equation coefficients at channel N
ALPHA (J,K)	K=1,3 elements of solution matrix for junction J
AS(J)	surface area of junction J
C(J)	concentration at junction J, not associated with a particular parameter
CBØD(J)	CBØD concentration at junction J
CBØDI(J)	initial CBØD concentration at junction J
CIN(J)	input concentration at junction J, not associated with a particular parameter
CS(J)	initial conservative concentration at junction J
DECAY(L)	temporary storage variable used in computations
DELMAX	closure criteria for solution matrix
DEPTH(N)	depth of channel N
DK1(J)	CBØD decay rate at junction J
DK2(J)	NBØD decay rate at junction J
DØS(J)	oxygen saturation at junction J
DVD(J)	divisor in solution matrix for junction J
EVAP(J)	net evaporation - rainfall at junction J
IPLT(I)	temporary storage variable used in computations and output routines

RMFR	river mile of fall line
RMJ(J)	river mile of junction J
RMUP	river mile of upstream end of segment
RN(I)	temporary storage variable used in computations and output routines
SEDMT(J)	sediment oxygen uptake rate at junction J
TEMP(J)	temperature at junction J
V(N)	velocity at channel N
VØL(J)	volume of junction J
WIDTH(N)	width of channel N
X(I)	temporary storage variable used in computations and output routines
XLEN	channel length in feet
XMIL	channel length in miles
XNØD(J)	NBØD concentration at junction J
XNØDI(J)	initial NBØD concentration at junction J
Y(I)	temporary storage variables used in computations and output routines
Z(N)	dispersion coefficient for channel N

SUBROUTINE DESCRIPTIONS

Following is a brief description of each subroutine in AUTØSS.

MAIN BRANCH: The main program. Its primary function is to direct program functions and print out the heading. The basic network data is read in here.

SETUP: Two things are done in this subroutine. The network of channels and junctions is established, and arrays are set to their respective default values.

NETDAT: This is one of the most important routines in the program. All data (except flow and quality data) is read in here. The data is read and interpolated over the entire network, and values are assigned to the channels or junctions.

FLØWS: The flow inputs are read. Once read, the flow inputs (or outflows) are distributed through the network.

FLØCMP: Called from FLØWS. The depths of flow and channel velocities are computed. Tidal velocities, if specified, take precedence over velocities computed. Once depths of flows are computed, the various physical parameters, depending on depth, are computed. (Cross-sectional areas, junction volumes, depths, velocities). In addition reaeration rates are computed if this option is specified.

QUALIN: The quality inputs are read in. Once read in the inputs are assigned the proper junction. If more than one input is read in for a junction, they are balanced according to their respective flows and concentrations. According to the equations: $qin=\Sigma q$ and $cin=\frac{\Sigma qc}{\Sigma q}$, it is also possible to fix mile points at a specified concentration.

QALCMP: The elements of the quality matrix are determined. CBØD, NBØD and conservative parameters are done.

DØCMP: The elements of the quality matrix for dissolved oxygen are determined here.

SØLVEX: The quality matrix is solved by the Gauss-Sidel iteration method with a relaxation factor. The maximum number of iterations is assigned as 1000 with a closing criteria of 0.001 ppm and a relaxation coefficient of 1.00 (These may be changed if desired).

INTER: Called from NETDAT. The routine arranges an array of input data in order according to river mile and assigns data values for each junction or channel.

TABU: Called from INTER. TABU performs a linear interpolation to obtain a data value at a specified point.

ØUTGØ: An output routine. It prints out data in tabular form.

DIVCK: Checks for zero divisors in the quality matrix. If a zero divisor is found, the error message is printed out and the program terminates.

JKFND: Determines the junction number for a corresponding river mile.

QALØUT: An output routine for quality data. A heading is printed followed by the data listing.

GRAPH: Constructs and prints a graph of the quality solution. It is called from QALØUT.

PROGRAM LISTING:

Following is a listing of program AUTØSS:

```
C*****************************************************************************
C*****************************************************************************
C**********                                                         ***********
C**********     PROGRAM AUTOSS - STEADY STATE WATER QUALITY         ***********
C**********                                                         ***********
C*****************************************************************************
C*****************************************************************************
C**********                                                         ***********
C**********     WRITTEN BY R.L. CRIM AND N.L. LOVELACE              ***********
C**********                                                         ***********
C**********     ENVIRONMENTAL PROTECTION AGENCY, REGION III         ***********
C**********     ANNAPOLIS FIELD OFFICE                              ***********
C**********     TECHNICAL DEVELOPMENT SECTION                       ***********
C**********     ANNAPOLIS SCIENCE CENTER, ANNAPOLIS, MD. 21401      ***********
C**********     PHONE: 301-268-5038 OR 202-261-2410                 ***********
C**********                                                         ***********
C*****************************************************************************
C*****************************************************************************
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LCBD/4HCBOD/,LNBD/4HNBOD/,LDO/4HDO  /,LHALT/4HHALT/,
     1     LFLOW/4HFLOW/,LDATA/4HDATA/
      NRD=1
      NWR=6
      NVT=0
      READ(NRD,10)(LALPHA(K),K=1,20)
   10 FORMAT(20A4)
      READ(NRD,20)RMDWN,RMUP,RMFR,NSECS
   20 FORMAT(3F10.0,I10)
```

```
      WRITE(NWR,30)
   30 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,13X,3HAAA,11X,3HUUU,9X,3H
     1UUU,5X,15(1HT),7X,11(1HO),9X,13(1HS),7X,13(1HS),/,1H ,12X,5HAAAAA,
     210X,3HUUU,9X,3HUUU,5X,15(1HT),6X,13(1HO),7X,14(1HS),6X,14(1HS),/,1
     3H ,11X,7(1HA),9X,3HUUU,9X,3HUUU,5X,15(1HT),5X,15(1HO),5X,2HSS,18X,
     42HSS,/,1H ,10X,3HAAA,3X,3HAAA,8X,3HUUU,9X,3HUUU,11X,3HTTT,11X,3HOO
     50,9X,3HOOO,6X,13(1HS),7X,13(1HS),/,1H ,9X,3HAAA,5X,3HAAA,7X,3HUUU,
     69X,3HUUU,11X,3HTTT,11X,3HOOO,9X,3HOOO,8X,12(1HS),7X,13(1HS),/,1H ,
     78X,3HAAA,7X,3HAAA,6X,3HUUU,9X,3HUUU,11X,3HTTT,11X,3HOOO,9X,3HOOO,
     817X,3HSSS,17X,3HSSS,/,1H ,7X,15(1HA),5X,3HUUU,9X,3HUUU,11X,3HTTT,
     911X,3HOOO,9X,3HOOO,17X,3HSSS,17X,3HSSS)
      WRITE(NWR,40)
   40 FORMAT(1H ,7X,15(1HA),5X,15(1HU),11X,3HTTT,11X,15(1HO),5X,15(1HS),
     15X,15(1HS),/,1H ,7X,3HAAA,9X,3HAAA,6X,13(1HU),12X,3HTTT,12X,13(1HO
     2),6X,14(1HS),6X,14(1HS),/,1H ,7X,3HAAA,9X,3HAAA,7X,11(1HU),13X,3HT
     3TT,13X,11(1HO),7X,13(1HS),7X,13(1HS),/,1H ,130(1H*),/,1H ,130(1H*)
     4)
      WRITE(NWR,50)(LALPHA(K),K=1,20),RMDWN,RMUP,RMFR,NSECS
   50 FORMAT(1H0,20(1H*),5X,32HSTEADY STATE WATER QUALITY MODEL,/,1H ,20
     1(1H*),/,1H ,20(1H*),5X,14HRUN TITLE.....,20A4,/,1H ,20(1H*),/,1H ,
     220(1H*),/,1H ,20(1H*),5X,18HBASIC NETWORK DATA,/,1H ,20(1H*),5X,31
     3HRIVER MILE AT DOWNSTREAM END...,F10.2,/,1H ,20(1H*),5X,31HRIVER M
     4ILE AT UPSTREAM END.....,F10.2,/,1H ,20(1H*),5X,31HRIVER MILE OF F
     5ALL LINE.........,F10.2,/,1H ,20(1H*),5X,31HNUMBER OF SECTIONS.....
     6.........,I10 )
      CALL SETUP
 1000 READ(NRD,60)LTYPE
   60 FORMAT(A4)
   62 IF(LTYPE.NE.LDATA)GO TO 65
      CALL NETDAT
      GO TO 1000
   65 IF(LTYPE.NE.LCBD)GO TO 90
      LCONS=LTYPE
      DO 70 J=1,NJ
      C(J)=CBODI(J)
```

```
 70 CONTINUE
    CALL QUALIN
    CALL QALCMP
    CALL SOLVEX
    DO 80 J=1,NJ
    CBOD(J)=C(J)
 80 CONTINUE
    GO TO 1000
 90 IF(LTYPE.NE.LNBD) GO TO 120
    LCONS=LTYPE
    DO 100 J=1,NJ
    C(J)=XNODI(J)
100 CONTINUE
    CALL QUALIN
    CALL QALCMP
    CALL SOLVEX
    DO 110 J=1,NJ
    XNOD(J)=C(J)
110 CONTINUE
    GO TO 1000
120 IF(LTYPE.NE.LDO) GO TO 140
    LCONS=LTYPE
    DO 130 J=1,NJ
    C(J)=OXY(J)
130 CONTINUE
    CALL QUALIN
    CALL DOCMP
    CALL SOLVEX
    DO 135 J=1,NJ
    CBOD(J)=0.0
    XNOD(J)=0.0
135 CONTINUE
    GO TO 1000
140 IF(LTYPE.NE.LFLOW)GO TO 150
    CALL FLOWS
```

```
      GO TO 1000
  150 IF(LTYPE.EQ.LHALT)GO TO 2000
          LCONS=LTYPE
          DO 160 J=1,NJ
          C(J)=CS(J)
  160     CONTINUE
          CALL QUALIN
          CALL QALCMP
          CALL SOLVEX
          GO TO 1000
 2000 STOP
          END
```

```
      SUBROUTINE SETUP
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      NC=NSECS
      NJ=NSECS+1
      XMIL=(RMUP-RMDWN)/FLOAT(NC)
      XLEN=XMIL*5285.0
      RMJ(1)=RMDWN
      DO 10 J=2,NJ
      RMJ(J)=RMJ(J-1)+XMIL
   10 CONTINUE
      RMC(1)= RMDWN+(XMIL/2.0)
      DO 20 N=2,NC
      RMC(N)=RMC(N-1)+XMIL
   20 CONTINUE
      DO 30 J=1,NJ
      QIN(J)=0.0
      QOUT(J)=0.0
      DVD(J) =0.0
      Q(J)=0.0
      A(J)=0.0
      Z(J)=0.0
      CIN(J)=0.0
      C(J)=0.0
      REAIR(J)=0.0
      VOL(J)=0.0
      PHOTO(J)=0.0
      EVAP(J)=0.0
      AS(J)=0.0
```

SUBROUTINE SETUP (Con't.)


```
      SEDMT(J)=0.0
      DOS(J)=0.0
      V(J)=0.0
      WIDTH(J)=0.0
      A1(J)=0.0
      A2(J)=0.0
      A3(J)=0.0
      TEMP(J)=20.0
      DK1(J)=0.0
      DK2(J)=0.0
      CBODI(J)=0.0
      CBOD(J)=0.0
      XNODI(J)=0.0
      XNOD(J)=0.0
      OXY(J)=0.0
      CS(J)=0.0
      NFS(J)=0
      DO 30 K=1,3
      ALPHA(J,K)=0.0
   30 CONTINUE
      RETURN
      END
```

```
      DO 130 N=1,NC
      IF(RMC(N).GT.RMFR) V(N)=0.0
  130 CONTINUE
      WRITE(NWR,140)
  140 FORMAT(1H0,20(1H*),5X,41HAVERAGE CHANNEL TIDAL VELOCITIES (FT/SEC)
     1,5X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,V)
      GO TO 1000
  150 IF(LABEL.NE.LTEMP) GO TO 170
      CALL INTER(TEMP,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,160)
  160 FORMAT(1H0,20(1H*),5X,35HJUNCTION WATER TEMPERATURES (DEG-C),5X,20
     1(1H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,TEMP)
      GO TO 1000
  170 IF(LABEL.NE.LVAP) GO TO 200
      CALL INTER(EVAP,NJ,X,Y,NPTS,RMJ,EVAP)
      WRITE(NWR,180)
  180 FORMAT(1H0,20(1H*),5X,34HNET EVAPORATION - RAINFALL (IN/MO),5X,20(
     11H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,EVAP)
      DO 190 J=1,NJ
      EVAP(J)=EVAP(J)/VAPFAC
  190 CONTINUE
      GO TO 1000
  200 IF(LABEL.NE.LPHOTO) GO TO 230
      CALL INTER(PHOTO,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,210)
  210 FORMAT(1H0,20(1H*),5X,61HAVERAGE DAILY PHOTOSYNTHESIS-RESPIRATION
     1RATE (GM O2/SQM/DAY),5X,20(1H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,PHOTO)
      DO 220 J=1,NJ
      PHOTO(J)=PHOTO(J)*CVFAC/86400.0
  220 CONTINUE
      GO TO 1000
```

```
230 IF(LABEL.NE.LSEDMT) GO TO 260
    CALL INTER(SEDMT,NJ,X,Y,NPTS,RMJ)
    WRITE(NWR,240)
240 FORMAT(1H0,20(1H*),5X,42HOXYGEN UPTAKE OF SEDIMENTS (GM O2/SQM/DAY
   1),5X,20(1H*) )
    CALL OUTGO(LVAR1,NJ,RMJ,SEDMT)
    DO 250 J=1,NJ
    SEDMT(J)=SEDMT(J)*CVFAC/86400.0
250 CONTINUE
    GO TO 1000
260 IF(LABEL.NE.LDISP) GO TO 280
    CALL INTER(Z,NC,X,Y,NPTS,RMC)
    WRITE(NWR,270)
270 FORMAT(1H0,20(1H*),5X,34HDISPERSION COEFFICIENTS (SQFT/SEC),5X,20(
   11H*) )
    CALL OUTGO(LVAR2,NC,RMC,Z)
    GO TO 1000
280 IF(LABEL.NE.LDK1)GO TO 310
    CALL INTER(DK1,NJ,X,Y,NPTS,RMJ)
    DO 285 J=1,NJ
    DK1(J)=DK1(J)*1.047**(TEMP(J)-20.0)
285 CONTINUE
    WRITE(NWR,290)
290 FORMAT(1H0,20(1H*),5X,52HCBOD DECAY RATES CORRECTED TO STREAM TEMP
   1S - (1/DAY),5X,20(1H*))
    CALL OUTGO(LVAR1,NJ,RMJ,DK1)
    DO 300 J=1,NJ
    DK1(J)=DK1(J)/86400.0
300 CONTINUE
    GO TO 1000
310 IF(LABEL.NE.LDK2)GO TO 340
    CALL INTER(DK2,NJ,X,Y,NPTS,RMJ)
    DO 315 J=1,NJ
    DK2(J)=DK2(J)*1.015**(TEMP(J)-20.0)
315 CONTINUE
```

```
      WRITE(NWR,320)
  320 FORMAT(1H0,20(1H*),5X,52HNBOD DECAY RATES CORRECTED TO STREAM TEMP
     1S - (1/DAY),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DK2)
      DO 330 J=1,NJ
      DK2(J)=DK2(J)/86400.0
  330 CONTINUE
      GO TO 1000
  340 IF(LABEL.NE.LREAI) GO TO 370
      CALL INTER(REAIR,NJ,X,Y,NPTS,RMJ)
      DO 345 J=1,NJ
      REAIR(J)=REAIR(J)*1.024**(TEMP(J)-20.0)
  345 CONTINUE
      WRITE(NWR,350)
  350 FORMAT(1H0,20(1H*),5X,58HINPUT REAERATION RATES CORRECTED TO STREA
     1M TEMPS - (1/DAY),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,REAIR)
      DO 360 J=1,NJ
      REAIR(J)=REAIR(J)/86400.0
  360 CONTINUE
      GO TO 1000
  370 IF(LABEL.NE.LDOS) GO TO 390
      CALL INTER(DOS,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,380)
  380 FORMAT(1H0,20(1H*),5X,46HINPUTED OXYGEN SATURATION CONCENTRATIONS
     1(PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DOS)
      GO TO 1000
  390 IF(LABEL.NE.LINIT) GO TO 470
      IF(LCST.NE.LCBD)GO TO 410
      CALL INTER(CBODI,NJ,X,Y,NPTS,RMJ)
  400 FORMAT(1H0,20(1H*),5X,33HINITIAL CBOD CONCENTRATIONS (PPM),5X,20(1
     1H*))
      WRITE(NWR,400)
      CALL OUTGO(LVAR1,NJ,RMJ,CBODI)
```

```
      GO TO 1000
  410 IF(LCST.NE.LNBD)GO TO 430
      CALL INTER(XNODI,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,420)
  420 FORMAT(1H0,20(1H*),5X,33HINITIAL NBOD CONCENTRATIONS (PPM),5X,20(1
     1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,XNODI)
      GO TO 1000
  430 IF(LCST.NE.LOXY) GO TO 450
      CALL INTER(OXY,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,440)
  440 FORMAT(1H0,20(1H*),5X,45HINITIAL DISSOLVED OXYGEN CONCENTRATIONS (
     1PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,OXY)
      GO TO 1000
  450 CALL INTER(CS,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,460)LCST
  460 FORMAT(1H0,20(1H*),5X,8HINITIAL ,A4,21H CONCENTRATIONS (PPM),5X,20
     1(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,CS)
      GO TO 1000
  470 IF(LABEL.NE.LCSA)GO TO 500
      DO 480 J=1,NJ
      DOS(J)=14.62-0.367*TEMP(J)+0.0045*(TEMP(J)**2.0)
  480 CONTINUE
      WRITE(NWR,490)
  490 FORMAT(1H0,20(1H*),5X,47HCOMPUTED OXYGEN SATURATION CONCENTRATIONS
     1 (PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DOS)
      GO TO 1000
  500 IF(LABEL.NE.LCK2)GO TO 510
      K2FL=1
      GO TO 1000
  510 WRITE(NWR,520)LABEL
  520 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H ,20(1H?),5X,10HDATA CODE ,
```

```
     1A4,36H DOES NOT EXIST - PROGRAM TERMINATES,/,1H ,130(1H?),/,1H ,
     2130(1H?))
           STOP
      5000 RETURN
           END
```

```
      SUBROUTINE FLOWS
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LVAR1/4HJUNC/,LVAR2/4HCHAN/
      DATA LSTOP/4HSTOP/
      DO 10 J=1,NJ
      QIN(J)=0.0
      QOUT(J)=0.0
      Q(J)=0.0
   10 CONTINUE
   20 READ(NRD,30)LABEL,DIST,QN,QAUT
   30 FORMAT(A4,6X,3F10.0)
      IF(LABEL.EQ.LSTOP)GO TO 40
      JUNC=JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      QIN(JUNC)=QIN(JUNC)+QN
      QOUT(JUNC)=QOUT(JUNC)+QAUT
      GO TO 20
   40 Q(NC)=-QIN(NJ)+QOUT(NJ)+EVAP(NJ)*AS(NJ)
      DO 50 N=2,NC
      NCHAN=NJ-N
      NCP=NCHAN+1
      Q(NCHAN)=Q(NCP)-QIN(NCP)+QOUT(NCP)+EVAP(NCP)*AS(NCP)
   50 CONTINUE
      CALL FLOCMP
      SUMIN=0.0
      SUMOUT=0.0
      DO 70 J=1,NJ
      SUMIN=SUMIN+QIN(J)
      SUMOUT=SUMOUT+QOUT(J)
```

```
      IF(EVAP(J).LT.0.0)GO TO 60
      SUMOUT=SUMOUT+EVAP(J)*AS(J)
      GO TO 70
   60 SUMIN=SUMIN-EVAP(J)*AS(J)
   70 CONTINUE
      IF(SUMOUT.GT.SUMIN)GO TO 80
      QOUT(1)=QOUT(1)+SUMIN-SUMOUT
      GO TO 90
   80 QIN(1)=QIN(1)+SUMOUT-SUMIN
   90 WRITE(NWR,100)SUMIN,SUMOUT,QOUT(1)
  100 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),5X,28HSTEADY STAT
     1E FLOW CONDITIONS,47X,25(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H ,25(1
     2H*),5X,15HTOTAL INFLOWS =,F10.1,4H CFS,46X,25(1H*),/,1H ,25(1H*),
     35X,18HTOTAL DIVERSIONS =,F10.1,4H CFS,43X,25(1H*),/,1H ,25(1H*),
     45X,32HOUTFLOW AT DOWNSTREAM JUNCTION =,F10.1,4H CFS,29X,25(1H*),/,
     51H ,130(1H*),/,1H ,130(1H*))
      WRITE(NWR,110)
  110 FORMAT(1H0,20(1H*),5X,13HINFLOWS (CFS),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,QIN)
      WRITE(NWR,120)
  120 FORMAT(1H0,20(1H*),5X,16HDIVERSIONS (CFS),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,QOUT)
      WRITE(NWR,130)
  130 FORMAT(1H0,20(1H*),5X,19HCHANNEL FLOWS (CFS),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,Q)
      RETURN
      END
```

```
      SUBROUTINE FLOCMP
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LVAR1/4HJUNC/,LVAR2/4HCHAN/
      DIMENSION DEPTH(250),RN(250)
      DO 10 N=1,NC
      DEPTH(N)=A3(N)
      IF(A1(N).EQ.0.0.OR.Q(N).EQ.0.0)GO TO 5
      DEPTH(N)=DEPTH(N)+A1(N)*ABS(Q(N))**A2(N)
    5 A(N)=DEPTH(N)*WIDTH(N)
      IF(NVT.EQ.1.AND.RMC(N).LE.RMFR)GO TO 10
      IF(A(N).EQ.0.0)GO TO 8
      V(N)=ABS(Q(N))/A(N)
      GO TO 10
    8 WRITE(NWR,9)N
    9 FORMAT(1H1,130(1H?),/,1H ,20(1H?),21HZERO AREA IN CHANNEL ,I3,44H
     1DEPTH OR WIDTH IS ZERO - PROGRAM TERMINATES  )
      STOP
   10 CONTINUE
      VOL(1)=XLEN*A(1)
      VOL(NJ)=XLEN*A(NC)
      NL=NJ-1
      DO 20 J=2,NL
      VOL(J)=XLEN*0.5*(A(J-1)+A(J))
   20 CONTINUE
      WRITE(NWR,30)
   30 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),5X,38HDEPTH OR VE
     1LOCITY DEPENDENT VARIABLES,38X,25(1H*),/,1H ,130(1H*),/,1H ,130(1H
     3*))
```

```
      WRITE(NWR,40)
   40 FORMAT(1H0,20(1H*),5X,38HCROSSECTIONAL AREAS OF CHANNELS (SQFT),
     15X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,A)
      WRITE(NWR,50)
   50 FORMAT(1H0,20(1H*),5X,19HCHANNEL DEPTHS (FT),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,DEPTH)
      WRITE(NWR,60)
   60 FORMAT(1H0,20(1H*),5X,27HCHANNEL VELOCITIES (FT/SEC),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,V)
      WRITE(NWR,70)
   70 FORMAT(1H0,20(1H*),5X,23HJUNCTION VOLUMES (CUFT),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,VOL)
      IF(K2FL.NE.1) GO TO 140
      DO 80 N=1,NC
      RN(N)= (12.9*(V(N)**0.5))/(DEPTH(N)**1.5)
   80 CONTINUE
      REAIR(NJ)=RN(NC)
      REAIR(1)=RN(1)
      DO 90 J=2,NL
      REAIR(J)=0.5*(RN(J)+RN(J-1))
   90 CONTINUE
      DO 100  J=1,NJ
      XT=TEMP(J)-20.0
      XF=1.024**XT
      REAIR(J)=REAIR(J)*XF
  100 CONTINUE
      WRITE(NWR,120)
  120 FORMAT(1H0,20(1H*),5X,33HCOMPUTED REAERATION RATES (1/DAY),5X,20(1
     1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,REAIR)
      DO 130 J=1,NJ
      REAIR(J)=REAIR(J)/86400.0
  130 CONTINUE
  140 RETURN
      END
```

```
      SUBROUTINE QUALIN
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LSTOP/4HSTOP/,LFIXE/4HFIXE/
      DATA LVAR1/4HJUNC/,LVAR2/4HCHAN/
      NOJFX=0
      DO 5 K=1,250
      NFS(K)=0
    5 CONTINUE
      DO 10 J=1,NJ
      CIN(J)=0.0
   10 CONTINUE
 1000 READ(NRD,20)LABEL,DIST,QN,CN,CST
   20 FORMAT(A4,6X,4F10.0)
      IF(LABEL.EQ.LSTOP)GO TO 30
      JUNC=JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      CIN(JUNC)=CN*QN+CIN(JUNC)
      IF(LABEL.NE.LFIXE) GO TO 1000
      NOJFX=NOJFX+1
      NFS(NOJFX)=JUNC
      C(JUNC)=CST
      GO TO 1000
   30 DO 50 J=1,NJ
      IF(QIN(J).EQ.0.0.AND.CIN(J).NE.0.0) GO TO 60
      IF(QIN(J).EQ.0.0.AND.CIN(J).EQ.0.0) GO TO 40
      CIN(J)=CIN(J)/QIN(J)
      GO TO 50
   40 CIN(J)=0.0
   50 CONTINUE
```

```
      GO TO 80
   60 WRITE(NWR,70)J,RMJ(J)
   70 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H0,10(1H?),5X,33HAN INFLOW W
     1AS READ IN AT JUNCTION ,I4,12H(RIVER MILE ,F7.2,54H) IN THE QUALIT
     2Y INPUT, BUT NOT IN THE HYDRAULIC INPUT,/,1H0,10(1H?),5X,18HPROGRA
     3M TERMINATES )
      STOP
   80 WRITE(NWR,90)LCONS
   90 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H
     1,25(1H*),5X,13HSTEADY STATE ,A4,27H INPUT CONCENTRATIONS (PPM),31X
     2,25(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H ,130(1H*),/,1H ,130(1H*),/
     3,1H0 )
      CALL OUTGO(LVAR1,NJ,RMJ,CIN)
      IF(NOJFX.EQ.0)GO TO 2000
      WRITE(NWR,100)
  100 FORMAT(1H0,25(1H*),5X,15HFIXED JUNCTIONS,/,1H0)
      DO 130 J=1,NOJFX
      K=NFS(J)
      WRITE(NWR,120)K,RMJ(K),C(K)
  120 FORMAT(1H ,25(1H.),5X, 9HJUNCTION ,I3,13H, RIVER MILE ,F7.2,14H, I
     1S FIXED AT ,1PE11.4,6H (PPM) )
  130 CONTINUE
 2000 RETURN
      END
```

```
      SUBROUTINE QALCMP
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LCBD/4HCBOD/,LNBD/4HNBOD/
      DIMENSION DECAY(250)
      IF(LCONS.NE.LCBD)GO TO 20
      DO 10 J=1,NJ
      DECAY(J)=DK1(J)
   10 CONTINUE
      GO TO 60
   20 IF(LCONS.NE.LNBD) GO TO 40
      DO 30 J=1,NJ
      DECAY(J)=DK2(J)
   30 CONTINUE
      GO TO 60
   40 DO 50 J=1,NJ
      DECAY(J)=0.0
   50 CONTINUE
   60 ALPHA(1,3)=QIN(1)*CIN(1)
      ALPHA(NJ,3)=QIN(NJ)*CIN(NJ)
      DVD(1)= -QOUT(1)-DECAY(1)*VOL(1)
      DVD(NJ)=-QOUT(NJ)-DECAY(NJ)*VOL(NJ)
      DO 1000 J=2,NC
      IF(NOJFX.EQ.0) GO TO 80
      DO 70 K=1,NOJFX
      IF(NFS(K).EQ.J) GO TO 1000
   70 CONTINUE
   80 DVD(J)=-QOUT(J)-DECAY(J)*VOL(J)
      ALPHA(J,3)=QIN(J)*CIN(J)
```

```
      JM1=J-1
      IF(Q(JM1).LT.0.0) GO TO 90
      ALPHA(J,1)=ABS(Q(JM1))+A(JM1)*Z(JM1)/XLEN
      DVD(J)=DVD(J)-A(JM1)*Z(JM1)/XLEN
      GO TO 100
   90 ALPHA(J,1)=Z(JM1)*A(JM1)/XLEN
      DVD(J)=DVD(J)-ABS(Q(JM1))-A(JM1)*Z(JM1)/XLEN
  100 IF(Q(J).GT.0.0) GO TO 110
      ALPHA(J,2)=ABS(Q(J))+A(J)*Z(J)/XLEN
      DVD(J)=DVD(J)-A(J)*Z(J)/XLEN
      GO TO 120
  110 ALPHA(J,2)=Z(J)*A(J)/XLEN
      DVD(J)=DVD(J)-ABS(Q(J))-A(J)*Z(J)/XLEN
  120 CONTINUE
 1000 CONTINUE
      IF(Q(NC).LT.0.0) GO TO 130
      ALPHA(NJ,1)=ABS(Q(NC))+A(NC)*Z(NC)/XLEN
      DVD(NJ)=DVD(NJ)-A(NC)*Z(NC)/XLEN
      GO TO 140
  130 ALPHA(NJ,1)=Z(NC)*A(NC)/XLEN
      DVD(NJ)=DVD(NJ)-ABS(Q(NC))-A(NC)*Z(NC)/XLEN
  140 IF(Q(1).GT.0.0) GO TO 150
      ALPHA(1,1)=ABS(Q(1))+A(1)*Z(1)/XLEN
      DVD(1)=DVD(1)-A(1)*Z(1)/XLEN
      GO TO 160
  150 ALPHA(1,1)=Z(1)*A(1)/XLEN
      DVD(1)=DVD(1)-ABS(Q(1))-A(1)*Z(1)/XLEN
  160 CALL DIVCK(NERR)
      IF(NERR.EQ.0)GO TO 2000
      WRITE(NWR,170)LCONS
  170 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H0,20(1H?),5X,16HZERO DIVISO
     1R IN ,A4,37H SOLUTION MATRIX - PROGRAM TERMINATES     )
      STOP
 2000 RETURN
      END
```

```
      SUBROUTINE DOCMP
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DVD(1)=-QOUT(1)-REAIR(1)*VOL(1)-EVAP(1)*AS(1)
      DVD(NJ)=-QOUT(NJ)-REAIR(NJ)*VOL(NJ)-EVAP(NJ)*AS(NJ)
      ALPHA(1,3)=QIN(1)*CIN(1)+PHOTO(1)-(DK1(1)*CBOD(1)+DK2(1)*XNOD(1))*
     1VOL(1)-SEDMT(1)*AS(1)+REAIR(1)*DOS(1)*VOL(1)
      ALPHA(NJ,3)=QIN(NJ)*CIN(NJ)+PHOTO(NJ)-(DK1(NJ)*CBOD(NJ)+DK2(NJ)*
     1XNOD(NJ))*VOL(NJ)-SEDMT(NJ)*AS(NJ)+REAIR(NJ)*DOS(NJ)*VOL(NJ)
      DO 1000 J=2,NC
      IF(NOJFX.EQ.0) GO TO 20
      DO 10 K=1,NOJFX
      IF(NFS(K).EQ.J) GO TO 1000
   10 CONTINUE
   20 DVD(J)=-QOUT(J)-REAIR(J)*VOL(J)-EVAP(J)*AS(J)
      ALPHA(J,3)=QIN(J)*CIN(J)+PHOTO(J)*AS(J)-(DK1(J)*CBOD(J)+DK2(J)*
     1XNOD(J))*VOL(J)-SEDMT(J)*AS(J)+REAIR(J)*DOS(J)*VOL(J)
      JM1=J-1
      IF(Q(JM1).LT.0.0) GO TO 30
      ALPHA(J,1)=ABS(Q(JM1))+A(JM1)*Z(JM1)/XLEN
      DVD(J)=DVD(J)-A(JM1)*Z(JM1)/XLEN
      GO TO 40
   30 ALPHA(J,1)=Z(JM1)*A(JM1)/XLEN
      DVD(J)=DVD(J)-ABS(Q(JM1))-A(JM1)*Z(JM1)/XLEN
   40 IF(Q(J).GT.0.0) GO TO 50
      ALPHA(J,2) =ABS(Q(J))+A(J)*Z(J)/XLEN
      DVD(J)=DVD(J)-A(J)*Z(J)/XLEN
      GO TO 60
   50 ALPHA(J,2)=Z(J)*A(J)/LEN
```

```
      DVD(J)=DVD(J)-ABS(Q(J))-A(J)*Z(J)/XLEN
   60 CONTINUE
 1000 CONTINUE
      IF(Q(NC).LT.0.0) GO TO 70
      ALPHA(NJ,1)=ABS(Q(NC))+A(NC)*Z(NC)/XLEN
      DVD(NJ)=DVD(NJ)-A(NC)*Z(NC)/XLEN
      GO TO 80
   70 ALPHA(NJ,1)=Z(NC)*A(NC)/XLEN
      DVD(NJ) = DVD(NJ)-ABS(Q(NC))-A(NC)*Z(NC)/XLEN
   80 IF(Q(1).GT.0.0) GO TO 90
      ALPHA(1,1)=ABS(Q(1))+A(1)*Z(1)/XLEN
      DVD(1)=DVD(1)-A(1)*Z(1)/XLEN
      GO TO 100
   90 ALPHA(1,1)=Z(1)*A(1)/XLEN
      DVD(1)=DVD(1)-ABS(Q(1))-A(1)*Z(1)/XLEN
  100 CALL DIVCK (NERR)
      IF(NERR.EQ.0)GO TO 2000
      WRITE(NWR,110)LCONS
  110 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H0,20(1H?),5X,16HZERO DIVISO
     1R IN ,A4,37H SOLUTION MATRIX - PROGRAM TERMINATES   )
      STOP
 2000 RETURN
      END
```

```
      SUBROUTINE SOLVEX
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      RELAX=1.0
      MAXCYC=1000
      DELMAX=0.001
      DO 1000  IT=1,MAXCYC
      BIG=0.0
      DO 30 J=2,NC
      IF(NOJFX.EQ.0) GO TO 20
      DO 10 K=1,NOJFX
      IF(J.EQ.NFS(K)) GO TO 30
   10 CONTINUE
   20 CNEW=0.0
      CNEW=CNEW-ALPHA(J,1)*C(J-1)/DVD(J)
      CNEW=CNEW-ALPHA(J,2)*C(J+1)/DVD(J)
      CNEW=CNEW-ALPHA(J,3)/DVD(J)
      DELC=CNEW-C(J)
      C(J)=C(J)+RELAX*DELC
      IF(ABS(DELC).LT.BIG) GO TO 30
      BIG= ABS(DELC)
      CHNG=DELC
      NBIG=J
   30 CONTINUE
      IF(NOJFX.EQ.0) GO TO 50
      DO 40 K=1,NOJFX
      IF(NJ.EQ.NFS(K)) GO TO 60
   40 CONTINUE
   50 CNEW=-ALPHA(NJ,1)*C(NC)/DVD(NJ)
```

```
      CNEW= CNEW-ALPHA(NJ,3)/DVD(NJ)
      DELC= CNEW-C(NJ)
      C(NJ)=C(NJ)+RELAX*DELC
      IF(ABS(DELC).LT.BIG) GO TO 60
      BIG=ABS(DELC)
      CHNG=DELC
      NBIG=NJ
   60 IF(NOJFX.EQ.0) GO TO 80
      DO 70 K=1,NOJFX
      IF(1.EQ.NFS(K)) GO TO 90
   70 CONTINUE
   80 CNEW =-ALPHA(1,1)*C(2)/DVD(1)
      CNEW =CNEW-ALPHA(1,3)/DVD(1)
      DELC =CNEW-C(1)
      C(1)=C(1)+RELAX*DELC
      IF(ABS(DELC).LT.BIG) GO TO 100
      BIG = ABS(DELC)
      CHNG=DELC
      NBIG=1
   90 CONTINUE
  100 CONTINUE
      IF(BIG.LE.DELMAX)  GO TO 120
 1000 CONTINUE
      WRITE(NWR,110)MAXCYC,CHNG,NBIG
  110 FORMAT(1H ,18HNO CONVERGENCE IN ,I4,26H CYCLES, MAXIMUM CHANGE IS,
     1E15.3,13H AT JUNC NO. ,I4,19H PROGRAM CONTINUING  )
      GO TO 140
  120 WRITE(NWR,130)IT
  130 FORMAT(1H ,15HCONVERGENCE IN ,I4,7H CYCLES    )
  140 CALL QALOUT
      RETURN
      END
```

```
      FUNCTION JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      NSET=1+IFIX(((DIST-RMDWN)/XMIL)+0.5)
      IF(DIST.LT.RMDWN) NSET=1
      IF(DIST.GT.RMUP) NSET=NJ
      JKFND=NSET
      RETURN
      END
```

```
      SUBROUTINE INTER(REVAL,NMAT,X,Y,NPTS,RM)
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DIMENSION REVAL(NMAT),X(NPTS),Y(NPTS),RM(NMAT)
      DO 21 I=1,NPTS
      TEST=X(I)
      JTMP=I
      DO 22 J=I,NPTS
      IF(X(J).GE.TEST) GO TO 22
      TEST=X(J)
      JTMP=J
   22 CONTINUE
      XTMP=X(I)
      YTMP=Y(I)
      X(I)=X(JTMP)
      Y(I)=Y(JTMP)
      X(JTMP)=XTMP
      Y(JTMP)=YTMP
   21 CONTINUE
      DO 10  J=1,NMAT
      XPT=RM(J)
      CALL TABU (X,Y,XPT,NPTS,YPT)
      REVAL(J)=YPT
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE TABU(X,Y,XPT,NPTS,YPT)
      IF(NPTS.EQ.1) GO TO 10
      DIMENSION X(NPTS),Y(NPTS)
      NPM1=NPTS-1
      IF(XPT.LE.X(1)) GO TO 10
      IF(XPT.GE.X(NPTS)) GO TO 20
      DO 30 J=1,NPM1
      IF(XPT.GE.X(J).AND.XPT.LE.X(J+1)) GO TO 40
   30 CONTINUE
   40 S=(XPT-X(J))/(X(J+1)-X(J))
      YPT=Y(J)+(Y(J+1)-Y(J))*S
      GO TO 50
   20 YPT=Y(NPTS)
      GO TO 50
   10 YPT=Y(1)
   50 RETURN
      END
```

```
      SUBROUTINE OUTGO(LVAR,NP,X,Y)
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DIMENSION X(250),Y(250)
      ILINE= NP/4
      IEXTA= NP-4*ILINE
      WRITE(NWR,10)LVAR,LVAR,LVAR,LVAR
   10 FORMAT(1H0,3X,A4,4X,5HRIVER,18X,A4,4X,5HRIVER,18X,A4,4X,5HRIVER,18
     1X,A4,4X,5HRIVER,/,1H ,4X,2HNO,5X,4HMILE,7X,5HVALUE,8X,2HNO,5X,4HMI
     2LE,7X,5HVALUE,8X,2HNO,5X,4HMILE,7X,5HVALUE,8X,2HNO,5X,4HMILE,7X,5H
     3VALUE )
      DO 30 I=1,ILINE
      I2=I+ILINE+IEXTA
      I3=I2+ILINE
      I4=I3+ILINE
      WRITE(NWR,20)I,X(I),Y(I),I2,X(I2),Y(I2),I3,X(I3),Y(I3),I4,X(I4),
     1             Y(I4)
   20 FORMAT(1H ,3X,I3,4X,F6.2,4X,1PE10.3,4X,I3,4X,0PF6.2,4X,1PE10.3,
     14X,I3,4X,0PF6.2,4X,1PE10.3,4X,I3,4X,0PF6.2,4X,1PE10.3)
   30 CONTINUE
      IF(IEXTA.EQ.0)GO TO 60
      IEND=ILINE+IEXTA
      IBEG=ILINE+1
      DO 50 I=IBEG,IEND
      WRITE(NWR,40)I,X(I),Y(I)
   40 FORMAT(1H ,3X,I3,4X,F6.2,4X,1PE10.3)
   50 CONTINUE
   60 RETURN
      END
```

```
      SUBROUTINE DIVCK(NERR)
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      NERR=0
      DO 10 J=1,NJ
      IF(NOJFX.EQ.0) GO TO 11
      DO 20 K=1,NOJFX
      IF(J.EQ.NFS(K)) GO TO 10
   20 CONTINUE
   11 IF(DVD(J).NE.0.0) GO TO 10
      WRITE(NWR,30)J
   30 FORMAT(1H ,20(1H?),5X,23HZERO DIVIDE AT JUNCTION,I5)
      NERR=NERR+1
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE QALOUT
      COMMON QIN(250),QOUT(250),Q(250),A1(250),A2(250),A3(250),
     1       WIDTH(250),AS(250),V(250),TEMP(250),EVAP(250),RMJ(250),
     2       PHOTO(250),SEDMT(250),Z(250),DK1(250),DK2(250),XNOD(250),
     3       REAIR(250),DOS(250),CBODI(250),CBOD(250),XNODI(250),
     4       OXY(250),CS(250),A(250),VOL(250),CIN(250),C(250),
     5       LALPHA(20),ALPHA(250,3),DVD(250),NFS(250),RMC(250)
      COMMON NC,NJ,XLEN,NOJFX,RMUP,RMDWN,RMFR,NSECS,XMIL,LCONS,K2FL,
     1       NRD,NWR,NVT
      DATA LCBD/4HCBOD/,LNBD/4HNBOD/,LDO/4HDO  /
      DATA LVAR1/4HJUNC/,LVAR2/4HCHAN/
      WRITE(NWR,10)(LALPHA(K),K=1,20),LCONS,QOUT(1)
   10 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,20(1H*),5X,20A4,5X,20(1H*
     1),/,1H ,130(1H*),/,1H ,20(1H*),5X,13HSTEADY STATE ,A4,21H CONCENTR
     2ATIONS (PPM),47X,20(1H*),/,1H ,20(1H*),90X,20(1H*),/,1H ,20(1H*),
     35X,27HOUTFLOW AT DOWNSTREAM END =,F10.1,4H CFS,44X,20(1H*),/,1H ,
     4130(1H*),/,1H ,130(1H*))
      WRITE(NWR,20)
   20 FORMAT(1H0,50X,20HCONCENTRATIONS (PPM) )
      XCK=1.0E-10
      DO 25 J=1,NJ
      IF(C(J).LT.XCK)C(J)=0.0
   25 CONTINUE
      CALL OUTGO(LVAR1,NJ,RMJ,C)
      IF(LCONS.EQ.LCBD.OR.LCONS.EQ.LNBD.OR.LCONS.EQ.LDO)GO TO 30
      GO TO 40
   30 BOTTOM=0.0
      GO TO 60
   40 BOTTOM=1.0E25
      DO 50 J=1,NJ
      IF(C(J).LT.BOTTOM)BOTTOM=C(J)
   50 CONTINUE
      IF(BOTTOM.LT.0.0)BOTTOM=0.0
      IBOT=IFIX(BOTTOM)
      BOTTOM=FLOAT(IBOT)
```

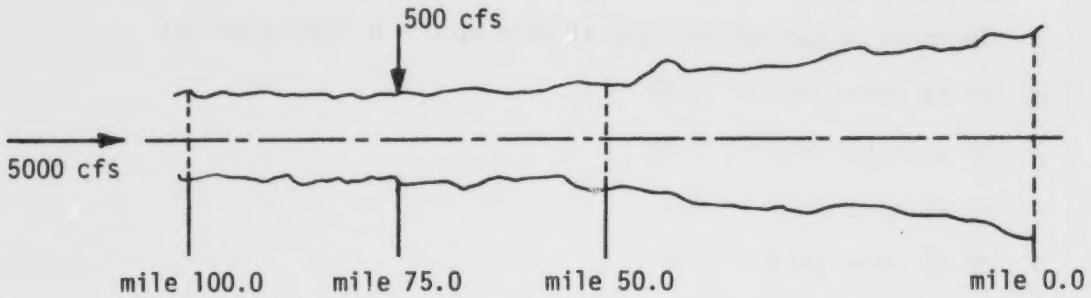
```
      TOP=0.0
      DO 70 J=1,NJ
      IF(C(J).GT.TOP)TOP=C(J)
   70 CONTINUE
      ITOP=IFIX(TOP+1.0)
      TOP=FLOAT(ITOP)
      WRITE(NWR,80)LCONS
   80 FORMAT(1H1,12HX=RIVER MILE,85X,3HY= ,A4,21H CONCENTRATIONS (PPM),
     1/,1H0)
      CENT=0.0
      NSKIP=0
      CALL GRAPH(BOTTOM,TOP,NJ,RMJ,C,CENT,NSKIP,NWR)
      RETURN
      END
```

```
      SUBROUTINE GRAPH(BOTTOM,TOP,NP,X,Y,CENT,NSKIP,NWR)
      DIMENSION X(NP),Y(NP),IPLT(100)
      DATA LCNT,LPLUS/1HI,1H+/
      DATA LRB,LRSTAR,LRPT,LRO/1H ,1H*,1H-,1H0/
      NDEX=NSKIP
      LINEZ=IABS(NSKIP)
      IF(NDEX.LT.1) NDEX=1
   40 WRITE(NWR,330) BOTTOM,TOP
  330 FORMAT(1H , 8X,1PE8.1,91X,E8.1)
      WRITE(NWR,310)
  310 FORMAT(1H ,4X,1HX,5X,101(1H.),5X,1HY )
      YS=(TOP-BOTTOM)/100.0
      NCENT=(CENT-BOTTOM)/YS
      DO 50 JFK=1,NP,NDEX
      DO 60 LY=1,100
      IPLT(LY)=LRB
   60 CONTINUE
      IF(NSKIP.GE.0) GO TO 3
      IF(NCENT.GT.0) IPLT(NCENT)=LCNT
      DO 5 LBJ=1,LINEZ
      WRITE(NWR,6)IPLT
    6 FORMAT(1H ,10X,1H.,100A1,1H.)
    5 CONTINUE
    3 NPOT=(Y(JFK)-BOTTOM)/YS
      IF(NPOT.GT.100) NPOT=100
      IF(NPOT.LT.1) NPOT=1
      IF(NCENT.GT.100) GO TO 550
      IF(NCENT.LE.0) GO TO 550
      IF(NPOT.LT.NCENT) GO TO 500
      LIMIT=NPOT-1
      IF(LIMIT.LT.1) GO TO 550
      DO 400 LL=NCENT,LIMIT
      IPLT(LL)=LPLUS
  400 CONTINUE
      IPLT(NCENT)=LCNT
```

```
      GO TO 550
  500 LIMIT=NPOT+1
      DO 501 LL=LIMIT,NCENT
      IPLT(LL)=LRPT
  501 CONTINUE
      IPLT(NCENT)= LCNT
  550 CONTINUE
    2 IPLT(NPOT)=LRSTAR
    4 WRITE(NWR,320) X(JFK),IPLT,Y(JFK)
  320 FORMAT(1H ,    1PE8.1,1X,1H,,100A1,1H,,   E8.1)
   50 CONTINUE
      WRITE(NWR,350)
  350 FORMAT(1H ,10X,101(1H,))
      RETURN
      END
```

EXAMPLE PROBLEM

Given the following river/estuary



and the following information:

1. Number of sections = 49
2. Fall line at mile 50.0
3. Width at mile 0.0 = 10,000.0 ft
   Width at mile 40.0 = 5,000.0 ft
4. Dispersion coeff. at mile 0.0 = 5,000.0 ft^2/sec
   Dispersion coeff. at mile 50.0 = 100.0 ft^2/sec
   Dispersion coeff. at mile 100.0 = 50.0 ft^2/sec
5. Tidal velocities = 1.5 ft/sec
6. Temperature = 25.0 °C
7. Evaporation - rainfall = 0.0 in/mo
8. Photosynthesis - respiration rate @ mile 0.0 = 1.5 gr $O_2/m^2/day$
   Photosynthesis - respiration rate @ mile 50.0 = 0.5 gr $O_2/m^2/day$
   Photosynthesis - respiration rate @ mile 100.0 = 0.0 gr $O_2/m^2/day$
9. CBØD decay rate = 0.23 at 20 °C
10. NBØD decay rate = 0.12 at 20 °C

11. Sediment oxygen uptake rate at mile 0.0 = 1.0 gr $O_2/m^2/day$

    Sediment oxygen uptake rate at mile 50.0 = 0.5 gr $O_2/m^2/day$

    Sediment oxygen uptake rate at mile 75.0 = 1.0 gr $O_2/m^2/day$

    Sediment oxygen uptake rate at mile 80.0 = 0.0 gr $O_2/m^2/day$

12. A1 at mile 100.0 = 0.02

    A1 at mile 51.0 = 0.05

    A1 at mile 50.0 = 0.0

13. A2 at mile 100.0 = 0.6

    A2 at mile 51.0 = 0.6

    A2 at mile 50.0 = 0.0

14. A3 at mile 100.0 = 0.0

    A3 at mile 51.0 = 0.0

    A3 at mile 50.0 = 15.0

PROBLEM STATEMENT

Run TDS (conservative) with mile 0.0 fixed at 20,000.0 ppm and the above conditions. Then, using computed reaeration rates and the following inputs:

Mile 100.0 (5000 cfs)	CBØD	= 6.0 ppm
	NBØD	= 6.0 ppm
	DØ	= 6.0 ppm
Mile 75.0 (500 cfs)	CBØD	= 20.0 ppm
	NBØD	= 20.0 ppm
	DØ	= 2.0 ppm

run CBØD, NBØD and DØ.

Next, run TDS with the flow at mile 100.0 changed to 1000.0 cfs and the same downstream boundary condition. Initial concentrations are assigned as follows:

CBØD and NBØD = 3.0 ppm

DØ = 7.0 ppm

TDS at mile 0.0 = 20,000.0 ppm

50.0 = 100.0 ppm

The data deck for this problem follows:

```
                AUTØSS - TEST PRØBLEM
        0.0          100.0          50.0                  49
DATA
WIDTH                2
     1                 0.0       10000.0
     2                50.0        5000.0
DISP                 3
     1                 0.0        5000.0
     2                50.0         100.0
     3               100.0          50.0
VELØ                 1
     1                 0.0           1.5
TEMP                 1
     1                 0.0          25.0
PHØTØ                3
     1                 0.0           1.5
     2                50.0           0.5
     3               100.0           0.0
SEDI                 4
     1                 0.0           1.0
     2                50.0           0.5
     3                75.0           1.0
     4                80.0           0.0
```

```
CDECAY        1
    1             0.0       0.23
NDECAY        1
    1             0.0       0.15
A1            3
    1           100.0       0.02
    2            51.0       0.05
    3            50.0        0.0
A2            3
    1           100.0        0.6
    2            51.0        0.6
    3            50.0        0.0
A3            2
    1            51.0        0.0
    2            50.0       15.0
C-SATDØ
C-REAER
INITCBØD      1
    1             0.0        3.0
INITNBØD      1
    1             0.0        3.0
INITDØ        1
    1             0.0        7.0
```

```
INITTDS          2
     1                0.0      20000.0
     2               50.0        100.0
STØP
FLØW
                    100.0       5000.0
                     75.0        500.0
STØP
TDS
FIXED                 0.0                                  20000.0
STØP
CBØD
                    100.0       5000.0          6.0
                     75.0        500.0         20.0
STØP
NBØD
                    100.0       5000.0          6.0
                     75.0        500.0         20.0
STØP
DØ
                    100.0       5000.0          6.0
                     75.0        500.0          2.0
STØP
```

```
FLOW
                100.0          1000.0
                 75.0           500.0
STOP
TDS
FIXED             0.0                                  20000.0
STOP
HALT
```

Several things should be noted:

1. CDECAY and NDECAY are entered after temperature. Had they been entered before the temperature, they would not be corrected since the temperature would have had its default value (20°C) at that time.

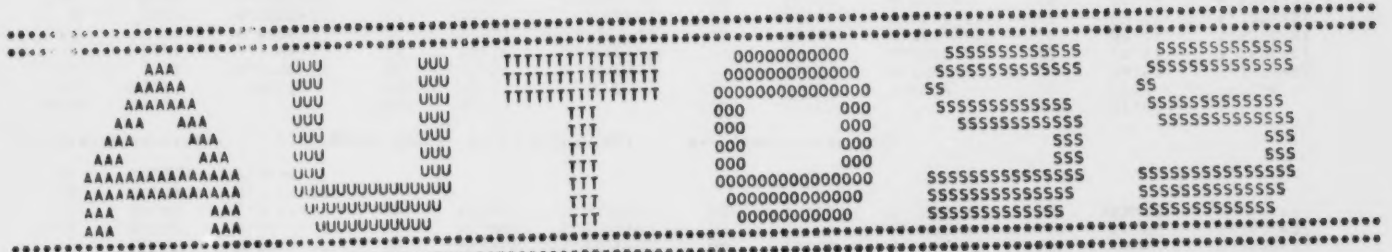
2. The order of entering physical data makes no difference except temperature dependent values should be entered after the temperature.

3. When a value is constant over the entire section, only one value need be entered - at any river mile.

4. CBØD and NCØD were run before DØ, because the DØ solution uses the CBØD and NBØD solutions.

This problem was run on the IBM 370 system at the National Institutes of Health facilities at Bethesda, Maryland. The total time was 4.39 seconds (excluding compile time) at a cost of $6.62 (excluding compile cost).

The output for this problem follows:



STEADY STATE WATER QUALITY MODEL

RUN TITLE..... AUTOSS - TEST PROBLEM

BASIC NETWORK DATA
RIVER MILE AT DOWNSTREAM END... 0.0
RIVER MILE AT UPSTREAM END..... 100.00
RIVER MILE OF FALL LINE..... 50.00
NUMBER OF SECTIONS..... 49

ESTUARY/STREAM INPUT DATA

CHANNEL WIDTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	9.898E+03	14	27.55	7.245E+03	26	52.04	5.000E+03	38	76.53	5.000E+03
2	3.06	9.694E+03	15	29.59	7.041E+03	27	54.08	5.000E+03	39	78.57	5.000E+03
3	5.10	9.490E+03	16	31.63	6.837E+03	28	56.12	5.000E+03	40	80.61	5.000E+03
4	7.14	9.286E+03	17	33.67	6.633E+03	29	58.16	5.000E+03	41	82.65	5.000E+03
5	9.18	9.082E+03	18	35.71	6.429E+03	30	60.20	5.000E+03	42	84.69	5.000E+03
6	11.22	8.878E+03	19	37.75	6.225E+03	31	62.24	5.000E+03	43	86.73	5.000E+03
7	13.27	8.673E+03	20	39.80	6.020E+03	32	64.29	5.000E+03	44	88.77	5.000E+03
8	15.31	8.469E+03	21	41.84	5.816E+03	33	66.33	5.000E+03	45	90.82	5.000E+03
9	17.35	8.265E+03	22	43.88	5.612E+03	34	68.37	5.000E+03	46	92.86	5.000E+03
10	19.39	8.061E+03	23	45.92	5.408E+03	35	70.41	5.000E+03	47	94.90	5.000E+03
11	21.43	7.857E+03	24	47.96	5.204E+03	36	72.45	5.000E+03	48	96.94	5.000E+03
12	23.47	7.653E+03	25	50.00	5.000E+03	37	74.49	5.000E+03	49	98.98	5.000E+03
13	25.51	7.449E+03									

JUNCTION SURFACE AREAS (SQFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.068E+08	15	28.57	7.704E+07	27	53.06	5.393E+07	39	77.55	5.393E+07
2	2.04	1.057E+08	16	30.61	7.484E+07	28	55.10	5.393E+07	40	79.59	5.393E+07
3	4.08	1.035E+08	17	32.65	7.264E+07	29	57.14	5.393E+07	41	81.63	5.393E+07
4	6.12	1.013E+08	18	34.69	7.044E+07	30	59.18	5.393E+07	42	83.67	5.393E+07
5	8.16	9.905E+07	19	36.73	6.824E+07	31	61.22	5.393E+07	43	85.71	5.393E+07
6	10.20	9.685E+07	20	38.78	6.604E+07	32	63.26	5.393E+07	44	87.75	5.393E+07
7	12.24	9.465E+07	21	40.82	6.383E+07	33	65.31	5.393E+07	45	89.80	5.393E+07
8	14.29	9.245E+07	22	42.86	6.163E+07	34	67.35	5.393E+07	46	91.84	5.393E+07
9	16.33	9.025E+07	23	44.90	5.943E+07	35	69.39	5.393E+07	47	93.88	5.393E+07
10	18.37	8.805E+07	24	46.94	5.723E+07	36	71.43	5.393E+07	48	95.92	5.393E+07
11	20.41	8.585E+07	25	48.98	5.503E+07	37	73.47	5.393E+07	49	97.96	5.393E+07
12	22.45	8.364E+07	26	51.02	5.393E+07	38	75.51	5.393E+07	50	100.00	5.393E+07
13	24.49	8.144E+07									
14	26.53	7.924E+07									

DISPERSION COEFFICIENTS (SQFT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	4.900E+03	14	27.55	2.300E+03	26	52.04	9.796E+01	38	76.53	7.347E+01
2	3.06	4.700E+03	15	29.59	2.100E+03	27	54.08	9.592E+01	39	78.57	7.143E+01
3	5.10	4.500E+03	16	31.63	1.900E+03	28	56.12	9.388E+01	40	80.61	6.939E+01
4	7.14	4.300E+03	17	33.67	1.700E+03	29	58.16	9.184E+01	41	82.65	6.735E+01
5	9.18	4.100E+03	18	35.71	1.500E+03	30	60.20	8.980E+01	42	84.69	6.531E+01
6	11.22	3.900E+03	19	37.75	1.300E+03	31	62.24	8.776E+01	43	86.73	6.327E+01
7	13.27	3.700E+03	20	39.80	1.100E+03	32	64.29	8.571E+01	44	88.77	6.123E+01
8	15.31	3.500E+03	21	41.84	9.000E+02	33	66.33	8.367E+01	45	90.82	5.918E+01
9	17.35	3.300E+03	22	43.88	7.000E+02	34	68.37	8.163E+01	46	92.86	5.714E+01
10	19.39	3.100E+03	23	45.92	5.000E+02	35	70.41	7.959E+01	47	94.90	5.510E+01
11	21.43	2.900E+03	24	47.96	3.000E+02	36	72.45	7.755E+01	48	96.94	5.306E+01
12	23.47	2.700E+03	25	50.00	1.000E+02	37	74.49	7.551E+01	49	98.98	5.102E+01

13 25.51 2.500E+03

•••••••••••••••••••• AVERAGE CHANNEL TIDAL VELOCITIES (FT/SEC) ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	0.0	38	76.53	0.0
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	0.0	39	78.57	0.0
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	0.0	40	80.61	0.0
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	0.0	41	82.65	0.0
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	0.0	42	84.69	0.0
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	0.0	43	86.73	0.0
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	0.0	44	88.77	0.0
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	0.0	45	90.82	0.0
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	0.0	46	92.86	0.0
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	0.0	47	94.90	0.0
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	0.0	48	96.94	0.0
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	0.0	49	98.98	0.0
13	25.51	1.500E+00									

•••••••••••••••••••• JUNCTION WATER TEMPERATURES (DEG-C) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.500E+01	15	28.57	2.500E+01	27	53.06	2.500E+01	39	77.55	2.500E+01
2	2.04	2.500E+01	16	30.61	2.500E+01	28	55.10	2.500E+01	40	79.59	2.500E+01
3	4.08	2.500E+01	17	32.65	2.500E+01	29	57.14	2.500E+01	41	81.63	2.500E+01
4	6.12	2.500E+01	18	34.69	2.500E+01	30	59.18	2.500E+01	42	83.67	2.500E+01
5	8.16	2.500E+01	19	36.73	2.500E+01	31	61.22	2.500E+01	43	85.71	2.500E+01
6	10.20	2.500E+01	20	38.78	2.500E+01	32	63.26	2.500E+01	44	87.75	2.500E+01
7	12.24	2.500E+01	21	40.82	2.500E+01	33	65.31	2.500E+01	45	89.80	2.500E+01
8	14.29	2.500E+01	22	42.86	2.500E+01	34	67.35	2.500E+01	46	91.84	2.500E+01
9	16.33	2.500E+01	23	44.90	2.500E+01	35	69.39	2.500E+01	47	93.88	2.500E+01
10	18.37	2.500E+01	24	46.94	2.500E+01	36	71.43	2.500E+01	48	95.92	2.500E+01
11	20.41	2.500E+01	25	48.98	2.500E+01	37	73.47	2.500E+01	49	97.96	2.500E+01
12	22.45	2.500E+01	26	51.02	2.500E+01	38	75.51	2.500E+01	50	100.00	2.500E+01
13	24.49	2.500E+01									
14	26.53	2.500E+01									

•••••••••••••••••••• AVERAGE DAILY PHOTOSYNTHESIS-RESPIRATION RATE (GM O2/SQM/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+00	15	28.57	9.286E-01	27	53.06	4.694E-01	39	77.55	2.245E-01
2	2.04	1.459E+00	16	30.61	8.878E-01	28	55.10	4.490E-01	40	79.59	2.041E-01
3	4.08	1.418E+00	17	32.65	8.469E-01	29	57.14	4.286E-01	41	81.63	1.837E-01
4	6.12	1.378E+00	18	34.69	8.061E-01	30	59.18	4.082E-01	42	83.67	1.633E-01
5	8.16	1.337E+00	19	36.73	7.653E-01	31	61.22	3.878E-01	43	85.71	1.429E-01
6	10.20	1.296E+00	20	38.78	7.245E-01	32	63.26	3.674E-01	44	87.75	1.225E-01
7	12.24	1.255E+00	21	40.82	6.837E-01	33	65.31	3.469E-01	45	89.80	1.020E-01
8	14.29	1.214E+00	22	42.86	6.429E-01	34	67.35	3.265E-01	46	91.84	8.164E-02
9	16.33	1.173E+00	23	44.90	6.020E-01	35	69.39	3.061E-01	47	93.88	6.123E-02
10	18.37	1.133E+00	24	46.94	5.612E-01	36	71.43	2.857E-01	48	95.92	4.082E-02
11	20.41	1.092E+00	25	48.98	5.204E-01	37	73.47	2.653E-01	49	97.96	2.041E-02
12	22.45	1.051E+00	26	51.02	4.898E-01	38	75.51	2.449E-01	50	100.00	5.960E-06
13	24.49	1.010E+00									
14	26.53	9.694E-01									

•••••••••••••••••••• OXYGEN UPTAKE OF SEDIMENTS (GM O2/SQM/DAY) ••••••••••••••••••••

JUNC	RIVER		JUNC	RIVER		JUNC	RIVER		JUNC	RIVER	

NO	MILE	VALUE	NO	MILE	VALUE	NO	MILE	VALUE	NO	MILE	VALUE
1	0.0	1.00E+00	15	28.57	7.143E-01	27	53.06	5.612E-01	39	77.55	4.899E-01
2	2.04	9.79E-01	16	30.61	6.939E-01	28	55.10	6.020E-01	40	79.59	8.172E-02
3	4.08	9.59E-01	17	32.65	6.735E-01	29	57.14	6.429E-01	41	81.63	0.0
4	6.12	9.388E-01	18	34.69	6.531E-01	30	59.18	6.837E-01	42	83.67	0.0
5	8.16	9.184E-01	19	36.73	6.327E-01	31	61.22	7.245E-01	43	85.71	0.0
6	10.20	8.980E-01	20	38.78	6.122E-01	32	63.26	7.653E-01	44	87.75	0.0
7	12.24	8.776E-01	21	40.82	5.918E-01	33	65.31	8.061E-01	45	89.80	0.0
8	14.29	8.571E-01	22	42.86	5.714E-01	34	67.35	8.469E-01	46	91.84	0.0
9	16.33	8.367E-01	23	44.90	5.510E-01	35	69.39	8.877E-01	47	93.88	0.0
10	18.37	8.163E-01	24	46.94	5.306E-01	36	71.43	9.286E-01	48	95.92	0.0
11	20.41	7.959E-01	25	48.98	5.102E-01	37	73.47	9.694E-01	49	97.96	0.0
12	22.45	7.755E-01	26	51.02	5.204E-01	38	75.51	8.980E-01	50	100.00	0.0
13	24.49	7.551E-01									
14	26.53	7.347E-01									

•••••••••••••••••••• CBOD DECAY RATES CORRECTED TO STREAM TEMPS - (1/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.894E-01	15	28.57	2.894E-01	27	53.06	2.894E-01	39	77.55	2.894E-01
2	2.04	2.894E-01	16	30.61	2.894E-01	28	55.10	2.894E-01	40	79.59	2.894E-01
3	4.08	2.894E-01	17	32.65	2.894E-01	29	57.14	2.894E-01	41	81.63	2.894E-01
4	6.12	2.894E-01	18	34.69	2.894E-01	30	59.18	2.894E-01	42	83.67	2.894E-01
5	8.16	2.894E-01	19	36.73	2.894E-01	31	61.22	2.894E-01	43	85.71	2.894E-01
6	10.20	2.894E-01	20	38.78	2.894E-01	32	63.26	2.894E-01	44	87.75	2.894E-01
7	12.24	2.894E-01	21	40.82	2.894E-01	33	65.31	2.894E-01	45	89.80	2.894E-01
8	14.29	2.894E-01	22	42.86	2.894E-01	34	67.35	2.894E-01	46	91.84	2.894E-01
9	16.33	2.894E-01	23	44.90	2.894E-01	35	69.39	2.894E-01	47	93.88	2.894E-01
10	18.37	2.894E-01	24	46.94	2.894E-01	36	71.43	2.894E-01	48	95.92	2.894E-01
11	20.41	2.894E-01	25	48.98	2.894E-01	37	73.47	2.894E-01	49	97.96	2.894E-01
12	22.45	2.894E-01	26	51.02	2.894E-01	38	75.51	2.894E-01	50	100.00	2.894E-01
13	24.49	2.894E-01									
14	26.53	2.894E-01									

•••••••••••••••••••• NBOD DECAY RATES CORRECTED TO STREAM TEMPS - (1/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.616E-01	15	28.57	1.616E-01	27	53.06	1.616E-01	39	77.55	1.616E-01
2	2.04	1.616E-01	16	30.61	1.616E-01	28	55.10	1.616E-01	40	79.59	1.616E-01
3	4.08	1.616E-01	17	32.65	1.616E-01	29	57.14	1.616E-01	41	81.63	1.616E-01
4	6.12	1.616E-01	18	34.69	1.616E-01	30	59.18	1.616E-01	42	83.67	1.616E-01
5	8.16	1.616E-01	19	36.73	1.616E-01	31	61.22	1.616E-01	43	85.71	1.616E-01
6	10.20	1.616E-01	20	38.78	1.616E-01	32	63.26	1.616E-01	44	87.75	1.616E-01
7	12.24	1.616E-01	21	40.82	1.616E-01	33	65.31	1.616E-01	45	89.80	1.616E-01
8	14.29	1.616E-01	22	42.86	1.616E-01	34	67.35	1.616E-01	46	91.84	1.616E-01
9	16.33	1.616E-01	23	44.90	1.616E-01	35	69.39	1.616E-01	47	93.88	1.616E-01
10	18.37	1.616E-01	24	46.94	1.616E-01	36	71.43	1.616E-01	48	95.92	1.616E-01
11	20.41	1.616E-01	25	48.98	1.616E-01	37	73.47	1.616E-01	49	97.96	1.616E-01
12	22.45	1.616E-01	26	51.02	1.616E-01	38	75.51	1.616E-01	50	100.00	1.616E-01
13	24.49	1.616E-01									
14	26.53	1.616E-01									

•••••••••••••••••••• A1 COEFFICIENT FOR FLOW EQUATION ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	0.0	14	27.55	0.0	26	52.04	4.936E-02	38	76.53	3.437E-02
2	3.06	0.0	15	29.59	0.0	27	54.08	4.811E-02	39	78.57	3.312E-02
3	5.10	0.0	16	31.63	0.0	28	56.12	4.686E-02	40	80.61	3.187E-02

4	7.14	0.0	17	33.67	0.0	29	58.16	4.561E-02	41	82.65	3.062E-02
5	9.18	0.0	18	35.71	0.0	30	60.20	4.437E-02	42	84.69	2.937E-02
6	11.22	0.0	19	37.75	0.0	31	62.24	4.312E-02	43	86.73	2.812E-02
7	13.27	0.0	20	39.80	0.0	32	64.29	4.187E-02	44	88.77	2.687E-02
8	15.31	0.0	21	41.84	0.0	33	66.33	4.062E-02	45	90.82	2.562E-02
9	17.35	0.0	22	43.88	0.0	34	68.37	3.937E-02	46	92.86	2.437E-02
10	19.39	0.0	23	45.92	0.0	35	70.41	3.812E-02	47	94.90	2.312E-02
11	21.43	0.0	24	47.96	0.0	36	72.45	3.687E-02	48	96.94	2.187E-02
12	23.47	0.0	25	50.00	0.0	37	74.49	3.562E-02	49	98.98	2.063E-02
13	25.51	0.0									

•••••••••••••••••••• A2 COEFFICIENT FOR FLOW EQUATION ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	0.0	14	27.55	0.0	26	52.04	6.000E-01	38	76.53	6.000E-01
2	3.06	0.0	15	29.59	0.0	27	54.08	6.000E-01	39	78.57	6.000E-01
3	5.10	0.0	16	31.63	0.0	28	56.12	6.000E-01	40	80.61	6.000E-01
4	7.14	0.0	17	33.67	0.0	29	58.16	6.000E-01	41	82.65	6.000E-01
5	9.18	0.0	18	35.71	0.0	30	60.20	6.000E-01	42	84.69	6.000E-01
6	11.22	0.0	19	37.75	0.0	31	62.24	6.000E-01	43	86.73	6.000E-01
7	13.27	0.0	20	39.80	0.0	32	64.29	6.000E-01	44	88.77	6.000E-01
8	15.31	0.0	21	41.84	0.0	33	66.33	6.000E-01	45	90.82	6.000E-01
9	17.35	0.0	22	43.88	0.0	34	68.37	6.000E-01	46	92.86	6.000E-01
10	19.39	0.0	23	45.92	0.0	35	70.41	6.000E-01	47	94.90	6.000E-01
11	21.43	0.0	24	47.96	0.0	36	72.45	6.000E-01	48	96.94	6.000E-01
12	23.47	0.0	25	50.00	0.0	37	74.49	6.000E-01	49	98.98	6.000E-01
13	25.51	0.0									

•••••••••••••••••••• A3 COEFFICIENT FOR FLOW EQUATION - RERESENTS DEPTH OF FLOW IF A1 AND/OR A2 ARE ••••••••••••••••••••
•••••••••••••••••••• NOT SPECIFIED (OR ARE ZERO) ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	0.0	38	76.53	0.0
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	0.0	39	78.57	0.0
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	0.0	40	80.61	0.0
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	0.0	41	82.65	0.0
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	0.0	42	84.69	0.0
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	0.0	43	86.73.	0.0
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	0.0	44	88.77	0.0
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	0.0	45	90.82	0.0
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	0.0	46	92.86	0.0
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	0.0	47	94.90	0.0
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	0.0	48	96.94	0.0
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	0.0	49	98.98	0.0
13	25.51	1.500E+01									

•••••••••••••••••••• COMPUTED OXYGEN SATURATION CONCENTRATIONS (PPM) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	2.02	8.258E+00	15	28.57	8.258E+00	27	53.06	8.258E+00	39	77.55	8.258E+00
2	4.04	8.258E+00	16	30.61	8.258E+00	28	55.10	8.258E+00	40	79.59	8.258E+00
3	6.08	8.258E+00	17	32.65	8.258E+00	29	57.14	8.258E+00	41	81.63	8.258E+00
4	8.12	8.258E+00	18	34.69	8.258E+00	30	59.18	8.258E+00	42	83.67	8.258E+00
5	10.16	8.258E+00	19	36.73	8.258E+00	31	61.22	8.258E+00	43	85.71	8.258E+00
6	10.20	8.258E+00	20	38.78	8.258E+00	32	63.26	8.258E+00	44	87.75	8.258E+00
7	12.24	8.258E+00	21	40.82	8.258E+00	33	65.31	8.258E+00	45	89.80	8.258E+00
8	14.29	8.258E+00	22	42.86	8.258E+00	34	67.35	8.258E+00	46	91.84	8.258E+00
9	16.33	8.258E+00	23	44.90	8.258E+00	35	69.39	8.258E+00	47	93.88	8.258E+00

10	18.37	8.[illegible]E+00	24	46.94	8.258E+00	36	71.43	8.258E+00	48	95.92	8.258E+00
11	20.41	8.[illegible]E+00	25	48.98	8.258E+00	37	73.47	8.258E+00	49	97.96	8.258E+00
12	22.45	8.[illegible]+00	26	51.02	8.258E+00	38	75.51	8.258E+00	50	100.00	8.258E+00
13	24.49	8.2[illegible]+00									
14	26.53	8.258[illegible]+00									

********** INITIAL CBOD CONCENTRATIONS (PPM) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.000E+00	15	28.57	3.000E+00	27	53.06	3.000E+00	39	77.55	3.000E+00
2	2.04	3.000E+00	16	30.61	3.000E+00	28	55.10	3.000E+00	40	79.59	3.000E+00
3	4.08	3.000E+00	17	32.65	3.000E+00	29	57.14	3.000E+00	41	81.63	3.000E+00
4	6.12	3.000E+00	18	34.69	3.000E+00	30	59.18	3.000E+00	42	83.67	3.000E+00
5	8.16	3.000E+00	19	36.73	3.000E+00	31	61.22	3.000E+00	43	85.71	3.000E+00
6	10.20	3.000E+00	20	38.78	3.000E+00	32	63.26	3.000E+00	44	87.75	3.000E+00
7	12.24	3.000E+00	21	40.82	3.000E+00	33	65.31	3.000E+00	45	89.80	3.000E+00
8	14.29	3.000E+00	22	42.86	3.000E+00	34	67.35	3.000E+00	46	91.84	3.000E+00
9	16.33	3.000E+00	23	44.90	3.000E+00	35	69.39	3.000E+00	47	93.88	3.000E+00
10	18.37	3.000E+00	24	46.94	3.000E+00	36	71.43	3.000E+00	48	95.92	3.000E+00
11	20.41	3.000E+00	25	48.98	3.000E+00	37	73.47	3.000E+00	49	97.96	3.000E+00
12	22.45	3.000E+00	26	51.02	3.000E+00	38	75.51	3.000E+00	50	100.00	3.000E+00
13	24.49	3.000E+00									
14	26.53	3.000E+00									

********** INITIAL NBOD CONCENTRATIONS (PPM) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.000E+00	15	28.57	3.000E+00	27	53.06	3.000E+00	39	77.55	3.000E+00
2	2.04	3.000E+00	16	30.61	3.000E+00	28	55.10	3.000E+00	40	79.59	3.000E+00
3	4.08	3.000E+00	17	32.65	3.000E+00	29	57.14	3.000E+00	41	81.63	3.000E+00
4	6.12	3.000E+00	18	34.69	3.000E+00	30	59.18	3.000E+00	42	83.67	3.000E+00
5	8.16	3.000E+00	19	36.73	3.000E+00	31	61.22	3.000E+00	43	85.71	3.000E+00
6	10.20	3.000E+00	20	38.78	3.000E+00	32	63.26	3.000E+00	44	87.75	3.000E+00
7	12.24	3.000E+00	21	40.82	3.000E+00	33	65.31	3.000E+00	45	89.80	3.000E+00
8	14.29	3.000E+00	22	42.86	3.000E+00	34	67.35	3.000E+00	46	91.84	3.000E+00
9	16.33	3.000E+00	23	44.90	3.000E+00	35	69.39	3.000E+00	47	93.88	3.000E+00
10	18.37	3.000E+00	24	46.94	3.000E+00	36	71.43	3.000E+00	48	95.92	3.000E+00
11	20.41	3.000E+00	25	48.98	3.000E+00	37	73.47	3.000E+00	49	97.96	3.000E+00
12	22.45	3.000E+00	26	51.02	3.000E+00	38	75.51	3.000E+00	50	100.00	3.000E+00
13	24.49	3.000E+00									
14	26.53	3.000E+00									

********** INITIAL DISSOLVED OXYGEN CONCENTRATIONS (PPM) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	7.000E+00	15	28.57	7.000E+00	27	53.06	7.000E+00	39	77.55	7.000E+00
2	2.04	7.000E+00	16	30.61	7.000E+00	28	55.10	7.000E+00	40	79.59	7.000E+00
3	4.08	7.000E+00	17	32.65	7.000E+00	29	57.14	7.000E+00	41	81.63	7.000E+00
4	6.12	7.000E+00	18	34.69	7.000E+00	30	59.18	7.000E+00	42	83.67	7.000E+00
5	8.16	7.000E+00	19	36.73	7.000E+00	31	61.22	7.000E+00	43	85.71	7.000E+00
6	10.20	7.000E+00	20	38.78	7.000E+00	32	63.26	7.000E+00	44	87.75	7.000E+00
7	12.24	7.000E+00	21	40.82	7.000E+00	33	65.31	7.000E+00	45	89.80	7.000E+00
8	14.29	7.000E+00	22	42.86	7.000E+00	34	67.35	7.000E+00	46	91.84	7.000E+00
9	16.33	7.000E+00	23	44.90	7.000E+00	35	69.39	7.000E+00	47	93.88	7.000E+00
10	18.37	7.000E+00	24	46.94	7.000E+00	36	71.43	7.000E+00	48	95.92	7.000E+00
11	20.41	7.000E+00	25	48.98	7.000E+00	37	73.47	7.000E+00	49	97.96	7.000E+00
12	22.45	7.000E+00	26	51.02	7.000E+00	38	75.51	7.000E+00	50	100.00	7.000E+00
13	24.49	7.000E+00									

14 26.53 7.000E+00

•••••••••••••••••••• INITIAL TDS CONCENTRATIONS (PPM) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	8.629E+03	27	53.06	1.000E+02	39	77.55	1.000E+02
2	2.04	1.919E+04	16	30.61	7.816E+03	28	55.10	1.000E+02	40	79.59	1.000E+02
3	4.08	1.838E+04	17	32.65	7.004E+03	29	57.14	1.000E+02	41	81.63	1.000E+02
4	6.12	1.756E+04	18	34.69	6.192E+03	30	59.18	1.000E+02	42	83.67	1.000E+02
5	8.16	1.675E+04	19	36.73	5.380E+03	31	61.22	1.000E+02	43	85.71	1.000E+02
6	10.20	1.594E+04	20	38.78	4.567E+03	32	63.26	1.000E+02	44	87.75	1.000E+02
7	12.24	1.513E+04	21	40.82	3.755E+03	33	65.31	1.000E+02	45	89.80	1.000E+02
8	14.29	1.431E+04	22	42.86	2.943E+03	34	67.35	1.000E+02	46	91.84	1.000E+02
9	16.33	1.350E+04	23	44.90	2.131E+03	35	69.39	1.000E+02	47	93.88	1.000E+02
10	18.37	1.269E+04	24	46.94	1.318E+03	36	71.43	1.000E+02	48	95.92	1.000E+02
11	20.41	1.188E+04	25	48.98	5.062E+02	37	73.47	1.000E+02	49	97.96	1.000E+02
12	22.45	1.107E+04	26	51.02	1.000E+02	38	75.51	1.000E+02	50	100.00	1.000E+02
13	24.49	1.025E+04									
14	26.53	9.441E+03									

DEPTH OR VELOCITY DEPENDENT VARIABLES

CROSSECTIONAL AREAS OF CHANNELS (SQFT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	4.331E+04	38	76.53	2.848E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	4.221E+04	39	78.57	2.744E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	4.112E+04	40	80.61	2.641E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	4.002E+04	41	82.65	2.537E+04
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	3.893E+04	42	84.69	2.434E+04
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	3.783E+04	43	86.73	2.330E+04
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	3.673E+04	44	88.77	2.227E+04
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	3.564E+04	45	90.82	2.123E+04
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	3.454E+04	46	92.86	2.020E+04
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	3.344E+04	47	94.90	1.916E+04
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	3.235E+04	48	96.94	1.813E+04
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	3.125E+04	49	98.98	1.709E+04
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	8.662E+00	38	76.53	5.696E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	8.443E+00	39	78.57	5.489E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	8.224E+00	40	80.61	5.282E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	8.004E+00	41	82.65	5.075E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	7.785E+00	42	84.69	4.868E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	7.566E+00	43	86.73	4.660E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	7.346E+00	44	88.77	4.453E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	7.127E+00	45	90.82	4.246E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	6.908E+00	46	92.86	4.039E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	6.689E+00	47	94.90	3.832E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	6.469E+00	48	96.94	3.625E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	6.250E+00	49	98.98	3.418E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	1.270E-01	38	76.53	1.756E-01
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	1.303E-01	39	78.57	1.822E-01
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	1.338E-01	40	80.61	1.893E-01
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	1.374E-01	41	82.65	1.971E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	1.413E-01	42	84.69	2.054E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	1.454E-01	43	86.73	2.146E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	1.497E-01	44	88.77	2.245E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	1.543E-01	45	90.82	2.355E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	1.592E-01	46	92.86	2.476E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	1.645E-01	47	94.90	2.609E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	1.700E-01	48	96.94	2.759E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	1.760E-01	49	98.98	2.926E-01
13	25.51	1.500E+00									

JUNCTION VOLUMES (CUFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09	15	28.57	1.156E+09	27	53.06	4.612E+08	39	77.55	3.016E+08
2	2.04	1.585E+09	16	30.61	1.123E+09	28	55.10	4.494E+08	40	79.59	2.904E+08
3	4.08	1.552E+09	17	32.65	1.090E+09	29	57.14	4.376E+08	41	81.63	2.792E+08
4	6.12	1.519E+09	18	34.69	1.057E+09	30	59.18	4.257E+08	42	83.67	2.681E+08
5	8.16	1.486E+09	19	36.73	1.024E+09	31	61.22	4.139E+08	43	85.71	2.569E+08
6	10.20	1.453E+09	20	38.78	9.905E+08	32	63.26	4.021E+08	44	87.75	2.457E+08
7	12.24	1.420E+09	21	40.82	9.575E+08	33	65.31	3.903E+08	45	89.80	2.346E+08
8	14.29	1.387E+09	22	42.86	9.245E+08	34	67.35	3.784E+08	46	91.84	2.234E+08
9	16.33	1.354E+09	23	44.90	8.915E+08	35	69.39	3.666E+08	47	93.88	2.122E+08
10	18.37	1.321E+09	24	46.94	8.585E+08	36	71.43	3.548E+08	48	95.92	2.011E+08
11	20.41	1.288E+09	25	48.98	8.254E+08	37	73.47	3.430E+08	49	97.96	1.899E+08
12	22.45	1.255E+09	26	51.02	6.380E+08	38	75.51	3.221E+08	50	100.00	1.843E+08
13	24.49	1.222E+09									
14	26.53	1.189E+09									

•••••••••••••••••••• COMPUTED REAERATION RATES (1/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01	15	28.57	3.062E-01	27	53.06	2.084E-01	39	77.55	4.649E-01
2	2.04	3.062E-01	16	30.61	3.062E-01	28	55.10	2.195E-01	40	79.59	5.014E-01
3	4.08	3.062E-01	17	32.65	3.062E-01	29	57.14	2.315E-01	41	81.63	5.423E-01
4	6.12	3.062E-01	18	34.69	3.062E-01	30	59.18	2.446E-01	42	83.67	5.885E-01
5	8.16	3.062E-01	19	36.73	3.062E-01	31	61.22	2.587E-01	43	85.71	6.409E-01
6	10.20	3.062E-01	20	38.78	3.062E-01	32	63.26	2.742E-01	44	87.75	7.005E-01
7	12.24	3.062E-01	21	40.82	3.062E-01	33	65.31	2.911E-01	45	89.80	7.689E-01
8	14.29	3.062E-01	22	42.86	3.062E-01	34	67.35	3.095E-01	46	91.84	8.479E-01
9	16.33	3.062E-01	23	44.90	3.062E-01	35	69.39	3.298E-01	47	93.88	9.396E-01
10	18.37	3.062E-01	24	46.94	3.062E-01	36	71.43	3.522E-01	48	95.92	1.047E+00
11	20.41	3.062E-01	25	48.98	3.062E-01	37	73.47	3.769E-01	49	97.96	1.174E+00
12	22.45	3.062E-01	26	51.02	2.546E-01	38	75.51	4.188E-01	50	100.00	1.243E+00
13	24.49	3.062E-01									
14	26.53	3.062E-01									

STEADY STATE FLOW CONDITIONS

TOTAL INFLOWS = 5500.0 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 5500.0 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	5.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	5.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-5.500E+03	14	27.55	-5.500E+03	26	52.04	-5.500E+03	38	76.53	-5.000E+03
2	3.06	-5.500E+03	15	29.59	-5.500E+03	27	54.08	-5.500E+03	39	78.57	-5.000E+03
3	5.10	-5.500E+03	16	31.63	-5.500E+03	28	56.12	-5.500E+03	40	80.61	-5.000E+03
4	7.14	-5.500E+03	17	33.67	-5.500E+03	29	58.16	-5.500E+03	41	82.65	-5.000E+03
5	9.18	-5.500E+03	18	35.71	-5.500E+03	30	60.20	-5.500E+03	42	84.69	-5.000E+03
6	11.22	-5.500E+03	19	37.75	-5.500E+03	31	62.24	-5.500E+03	43	86.73	-5.000E+03
7	13.27	-5.500E+03	20	39.80	-5.500E+03	32	64.29	-5.500E+03	44	88.77	-5.000E+03
8	15.31	-5.500E+03	21	41.84	-5.500E+03	33	66.33	-5.500E+03	45	90.82	-5.000E+03
9	17.35	-5.500E+03	22	43.88	-5.500E+03	34	68.37	-5.500E+03	46	92.86	-5.000E+03

10	19.39	-5.500E+03	23	45.92	-5.500E+03	35	70.41	-5.500E+03	47	94.90	-5.000E+03
11	21.43	-5.500E+03	24	47.96	-5.500E+03	36	72.45	-5.500E+03	48	96.94	-5.000E+03
12	23.47	-5.500E+03	25	50.00	-5.500E+03	37	74.49	-5.500E+03	49	98.98	-5.000E+03
13	25.51	-5.500E+03									

STEADY STATE TDS INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS

JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 2.0000E+04 (PPM)

CONVERGENCE IN 429 CYCLES

AUTOSS - TEST PROBLEM

STEADY STATE IDS CONCENTRATIONS (PPM)

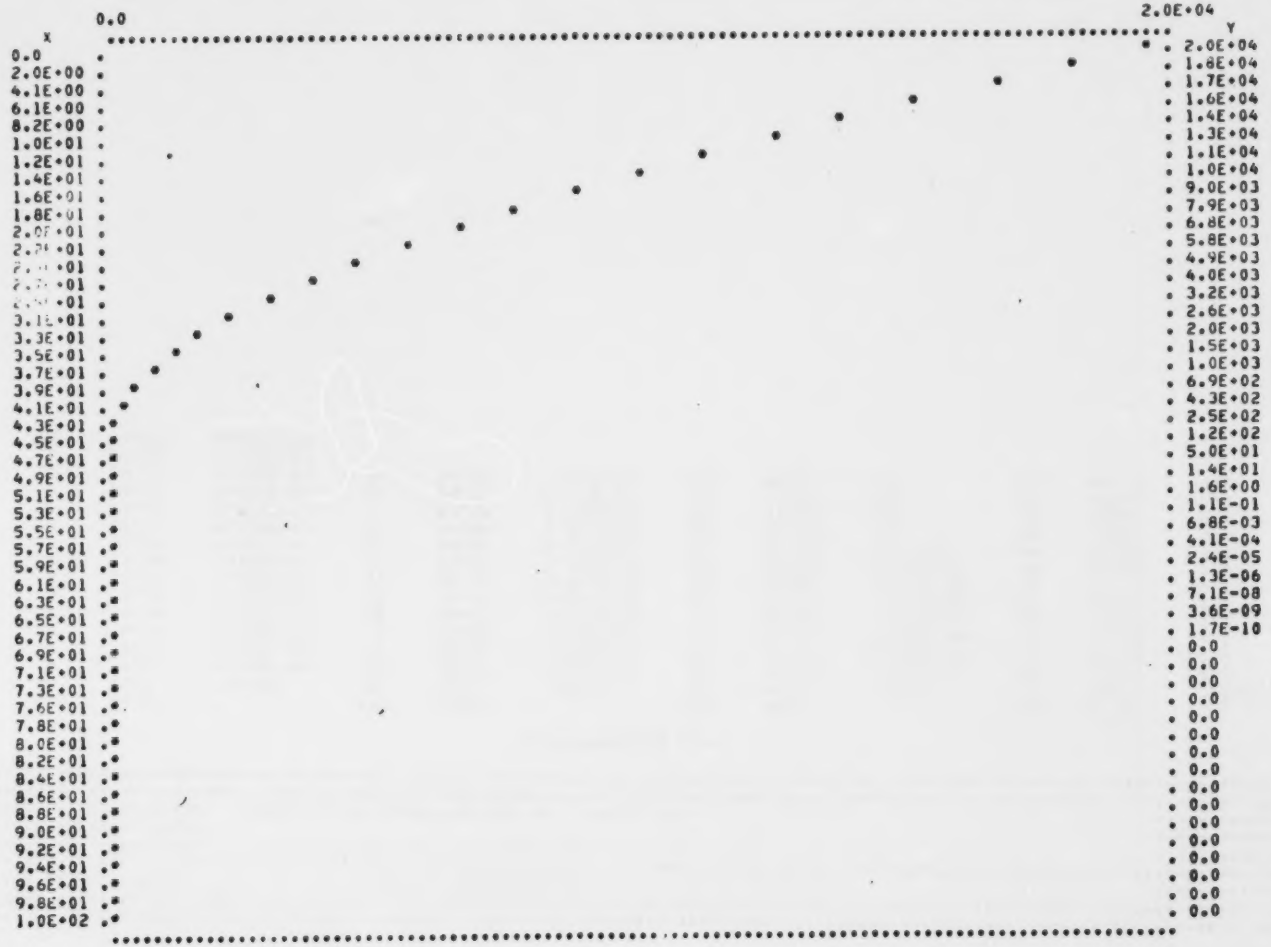
OUTFLOW AT DOWNSTREAM END = 5500.0 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	3.246E+03	27	53.06	1.060E-01	39	77.55	0.0
2	2.04	1.849E+04	16	30.61	2.561E+03	28	55.10	6.774E-03	40	79.59	0.0
3	4.08	1.702E+04	17	32.65	1.963E+03	29	57.14	4.138E-04	41	81.63	0.0
4	6.12	1.557E+04	18	34.69	1.454E+03	30	59.18	2.414E-05	42	83.67	0.0
5	8.16	1.417E+04	19	36.73	1.031E+03	31	61.22	1.343E-06	43	85.71	0.0
6	10.20	1.281E+04	20	38.78	6.924E+02	32	63.26	7.120E-08	44	87.75	0.0
7	12.24	1.150E+04	21	40.82	4.335E+02	33	65.31	3.588E-09	45	89.80	0.0
8	14.29	1.023E+04	22	42.86	2.470E+02	34	67.35	1.717E-10	46	91.84	0.0
9	16.33	9.030E+03	23	44.90	1.231E+02	35	69.39	0.0	47	93.88	0.0
10	18.37	7.886E+03	24	46.94	4.998E+01	36	71.43	0.0	48	95.92	0.0
11	20.41	6.809E+03	25	48.98	1.415E+01	37	73.47	0.0	49	97.96	0.0
12	22.45	5.802E+03	26	51.02	1.588E+00	38	75.51	0.0	50	100.00	0.0
13	24.49	4.870E+03									
14	26.53	4.017E+03									

X=RIVER MILE

Y= TDS CONCENTRATIONS (PPM)



STEADY STATE CBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

CONVERGENCE IN 84 CYCLES

AUTOSS - TEST PROBLEM

STEADY STATE CBOD CONCENTRATIONS (PPM)

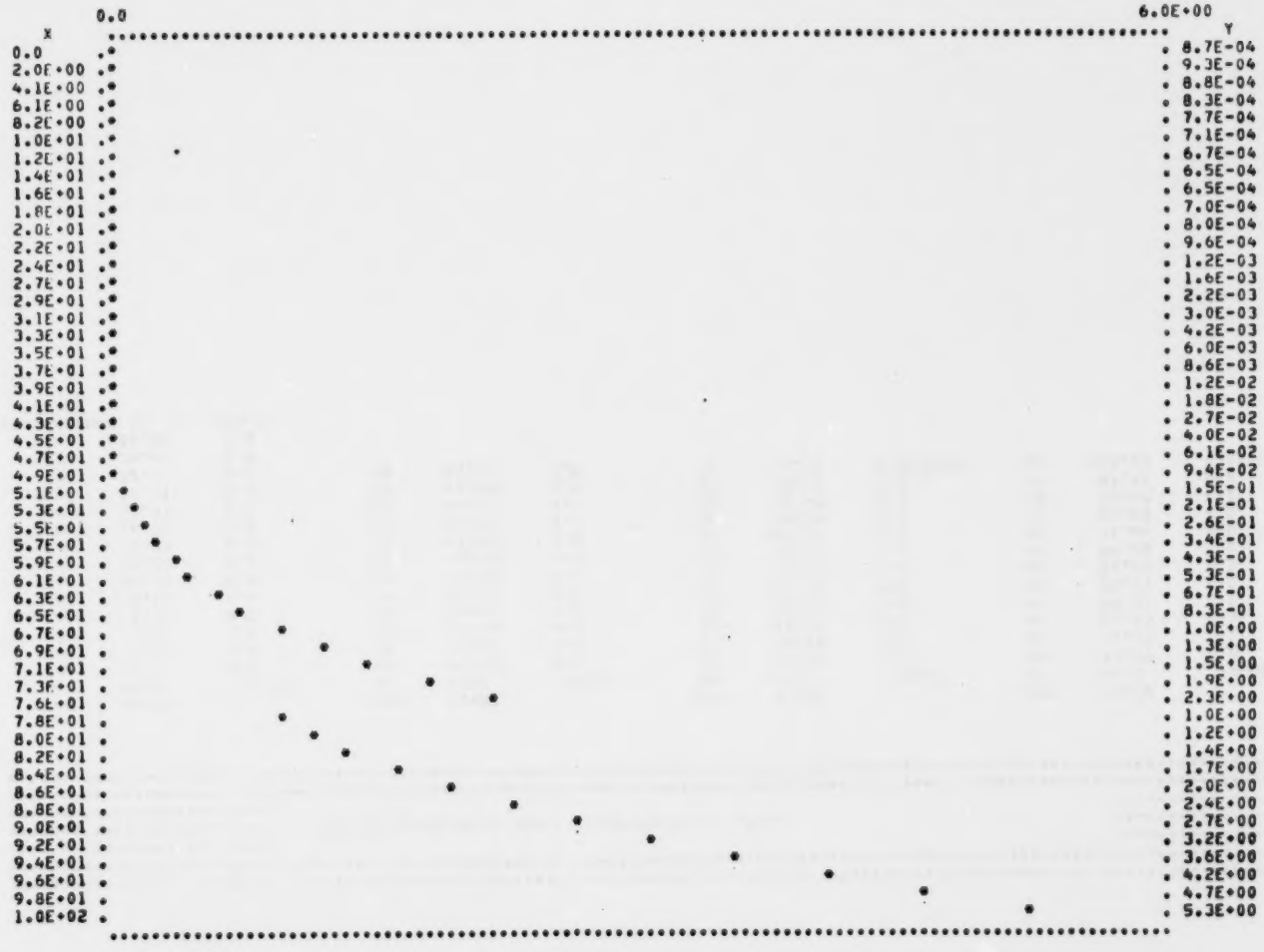
OUTFLOW AT DOWNSTREAM END = 5500.0 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.672E-04	15	28.57	2.191E-03	27	53.06	2.066E-01	39	77.55	1.046E+00
2	2.04	9.310E-04	16	30.61	3.022E-03	28	55.10	2.649E-01	40	79.59	1.205E+00
3	4.08	8.849E-04	17	32.65	4.227E-03	29	57.14	3.367E-01	41	81.63	1.437E+00
4	6.12	8.276E-04	18	34.69	5.982E-03	30	59.18	4.256E-01	42	83.67	1.705E+00
5	8.16	7.672E-04	19	36.73	8.555E-03	31	61.22	5.350E-01	43	85.71	2.011E+00
6	10.20	7.114E-04	20	38.78	1.237E-02	32	63.26	6.687E-01	44	87.75	2.356E+00
7	12.24	6.681E-04	21	40.82	1.807E-02	33	65.31	8.314E-01	45	89.80	2.744E+00
8	14.29	6.454E-04	22	42.86	2.671E-02	34	67.35	1.028E+00	46	91.84	3.175E+00
9	16.33	6.519E-04	23	44.90	4.000E-02	35	69.39	1.263E+00	47	93.88	3.649E+00
10	18.37	6.979E-04	24	46.94	6.073E-02	36	71.43	1.544E+00	48	95.92	4.168E+00
11	20.41	7.963E-04	25	48.98	9.366E-02	37	73.47	1.876E+00	49	97.96	4.730E+00
12	22.45	9.644E-04	26	51.02	1.470E-01	38	75.51	2.266E+00	50	100.00	5.332E+00
13	24.49	1.227E-03									
14	26.53	1.618E-03									

X=RIVER MILE

Y= CBOD CONCENTRATIONS (PPM)



STEADY STATE NBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

CONVERGENCE IN 127 CYCLES

DIOSS - TEST PROBLEM

STEADY STATE NBOD CONCENTRATIONS (PPM)

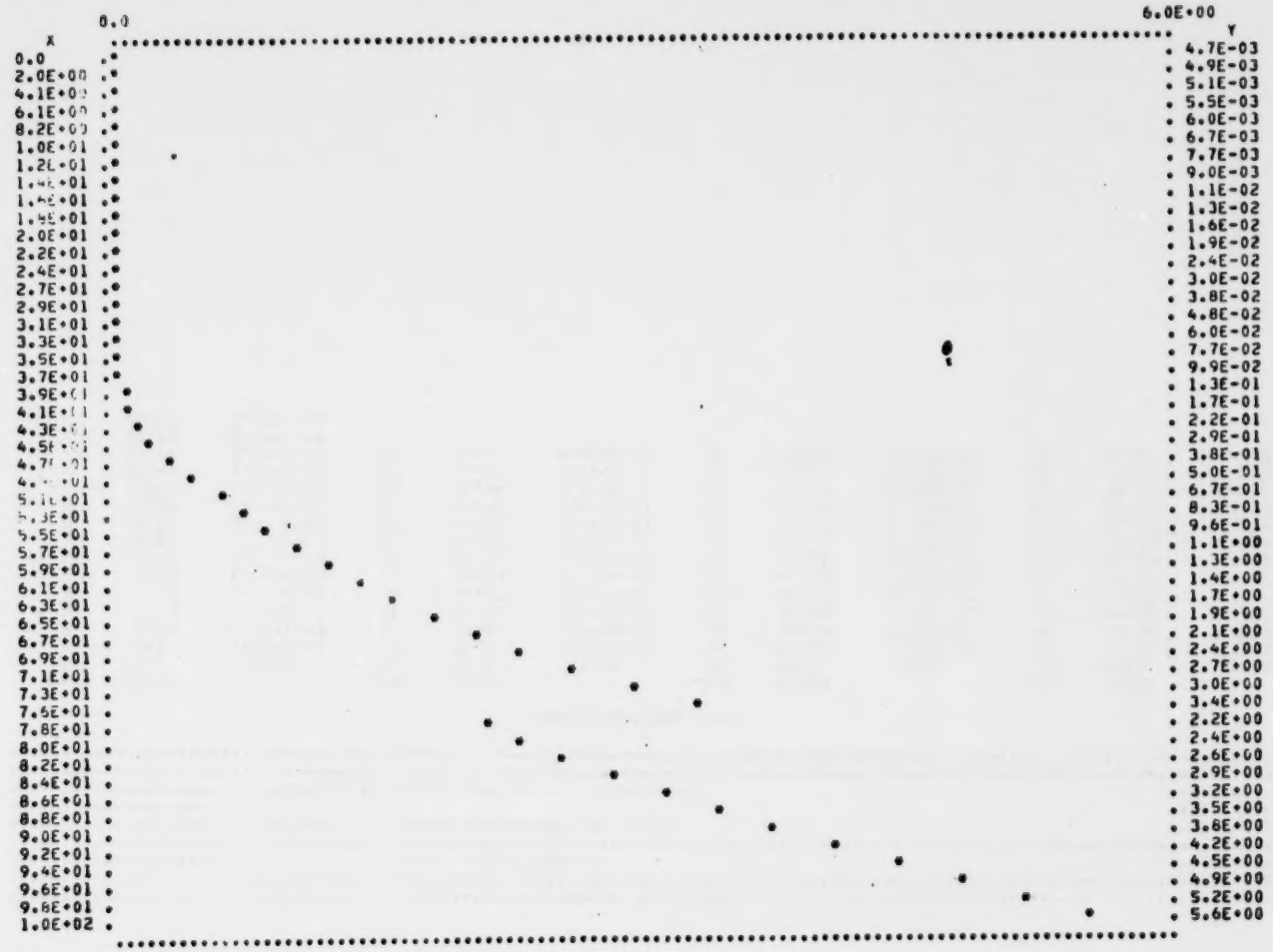
OUTFLOW AT DOWNSTREAM END = 5500.0 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.736E-03	15	28.57	3.758E-02	27	53.06	8.253E-01	39	77.55	2.181E+00
2	2.04	4.931E-03	16	30.61	4.754E-02	28	55.10	9.569E-01	40	79.59	2.374E+00
3	4.08	5.145E-03	17	32.65	6.046E-02	29	57.14	1.103E+00	41	81.63	2.630E+00
4	6.12	5.425E-03	18	34.69	7.730E-02	30	59.18	1.266E+00	42	83.67	2.905E+00
5	8.16	6.010E-03	19	36.73	9.933E-02	31	61.22	1.449E+00	43	85.71	3.196E+00
6	10.20	6.7[illegible]E-03	20	38.78	1.283E-01	32	63.26	1.652E+00	44	87.75	3.503E+00
7	12.24	7.6[illegible]E-03	21	40.82	1.667E-01	33	65.31	1.877E+00	45	89.80	3.826E+00
8	14.29	8.9[illegible]E-03	22	42.86	2.176E-01	34	67.35	2.126E+00	46	91.84	4.162E+00
9	16.33	1.0[illegible]E-02	23	44.90	2.858E-01	35	69.39	2.399E+00	47	93.88	4.510E+00
10	18.37	1.2[illegible]E-02	24	46.94	3.775E-01	36	71.43	2.698E+00	48	95.92	4.868E+00
11	20.41	1.5[illegible]E-02	25	48.98	5.014E-01	37	73.47	3.023E+00	49	97.96	5.235E+00
12	22.45	1.9[illegible]E-02	26	51.02	6.698E-01	38	75.51	3.375E+00	50	100.00	5.607E+00
13	24.49	2.3[illegible]E-02									
14	26.53	2.9[illegible]E-02									

X=RIVER MILE

Y= NBOD CONCENTRATIONS (PPM)



STEADY STATE DO INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+00	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

CONVERGENCE IN 74 CYCLES

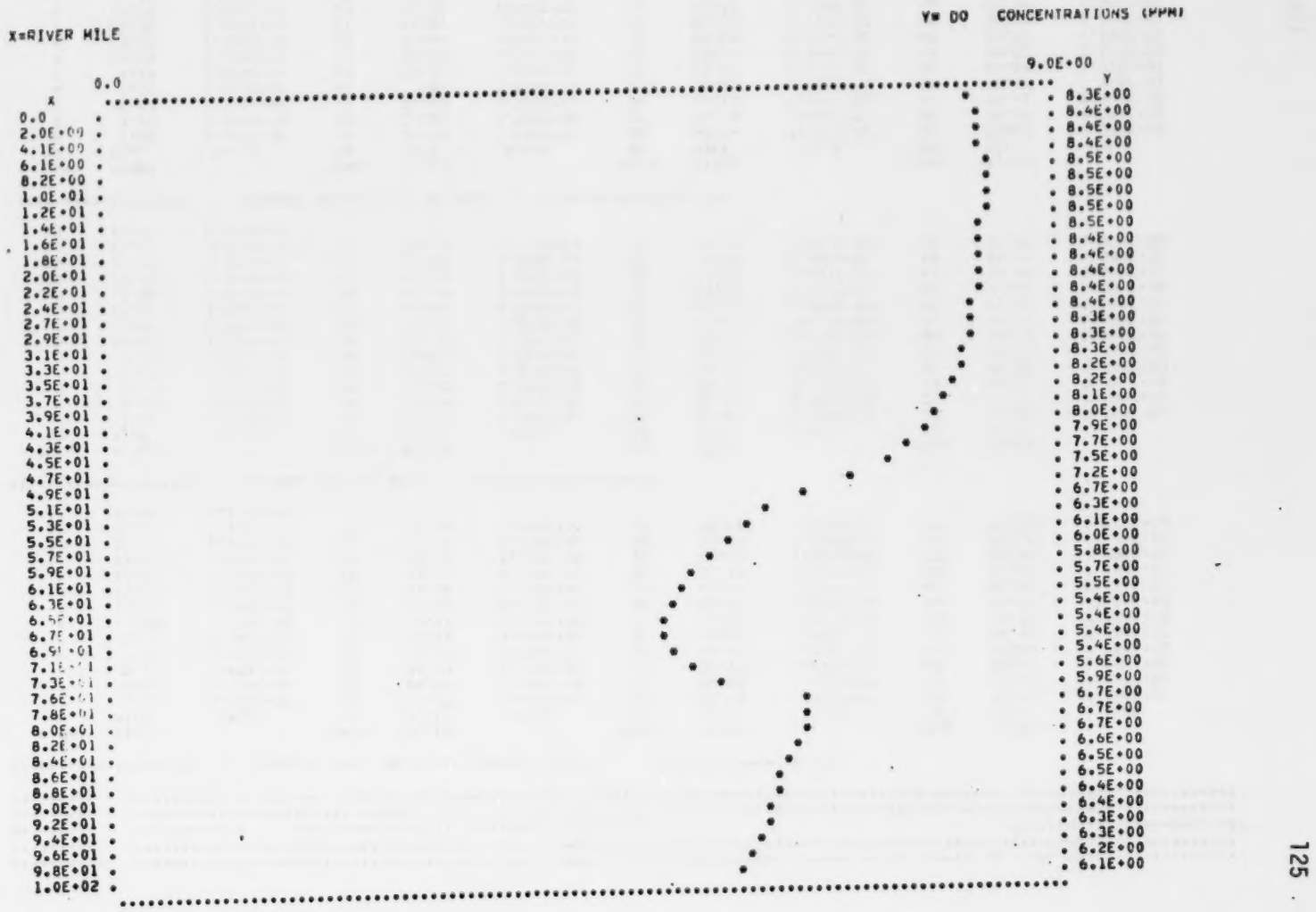
AUTOSS - TEST PROBLEM

STEADY STATE DO CONCENTRATIONS (PPM)

OUTFLOW AT DOWNSTREAM END = 5500.0 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.318E+00	15	28.57	8.341E+00	27	53.06	6.314E+00	39	77.55	6.668E+00
2	2.04	8.378E+00	16	30.61	8.309E+00	28	55.10	6.129E+00	40	79.59	6.746E+00
3	4.08	8.420E+00	17	32.65	8.271E+00	29	57.14	5.961E+00	41	81.63	6.684E+00
4	6.12	8.447E+00	18	34.69	8.226E+00	30	59.18	5.804E+00	42	83.67	6.601E+00
5	8.16	8.463E+00	19	36.73	8.169E+00	31	61.22	5.662E+00	43	85.71	6.526E+00
6	10.20	8.470E+00	20	38.78	8.098E+00	32	63.26	5.539E+00	44	87.75	6.460E+00
7	12.24	8.471E+00	21	40.82	8.005E+00	33	65.31	5.445E+00	45	89.80	6.403E+00
8	14.29	8.466E+00	22	42.86	7.881E+00	34	67.35	5.388E+00	46	91.84	6.354E+00
9	16.33	8.457E+00	23	44.90	7.713E+00	35	69.39	5.382E+00	47	93.88	6.308E+00
10	18.37	8.445E+00	24	46.94	7.480E+00	36	71.43	5.445E+00	48	95.92	6.260E+00
11	20.41	8.430E+00	25	48.98	7.150E+00	37	73.47	5.600E+00	49	97.96	6.198E+00
12	22.45	8.412E+00	26	51.02	6.675E+00	38	75.51	5.878E+00	50	100.00	6.101E+00
13	24.49	8.391E+00									
14	26.53	8.368E+00									


Y= DO CONCENTRATIONS (PPM)
X=RIVER MILE
9.0E+00
0.0
X
Y
0.0
2.0E+00
4.1E+00
6.1E+00
8.2E+00
1.0E+01
1.2E+01
1.4E+01
1.6E+01
1.8E+01
2.0E+01
2.2E+01
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3.1E+01
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6.3E+00
6.3E+00
6.2E+00
6.1E+00

DEPTH OR VELOCITY DEPENDENT VARIABLES

CROSSECTIONAL AREAS OF CHANNELS (SQFT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	1.986E+04	38	76.53	1.084E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	1.936E+04	39	78.57	1.045E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	1.886E+04	40	80.61	1.005E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	1.835E+04	41	82.65	9.660E+03
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	1.785E+04	42	84.69	9.266E+03
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	1.735E+04	43	86.73	8.872E+03
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	1.685E+04	44	88.77	8.478E+03
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	1.634E+04	45	90.82	8.084E+03
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	1.584E+04	46	92.86	7.689E+03
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	1.534E+04	47	94.90	7.295E+03
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	1.483E+04	48	96.94	6.901E+03
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	1.433E+04	49	98.98	6.507E+03
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	3.972E+00	38	76.53	2.169E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	3.872E+00	39	78.57	2.090E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	3.771E+00	40	80.61	2.011E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	3.671E+00	41	82.65	1.932E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	3.570E+00	42	84.69	1.853E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	3.470E+00	43	86.73	1.774E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	3.369E+00	44	88.77	1.696E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	3.269E+00	45	90.82	1.617E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	3.168E+00	46	92.86	1.538E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	3.067E+00	47	94.90	1.459E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	2.967E+00	48	96.94	1.380E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	2.866E+00	49	98.98	1.301E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	7.552E-02	38	76.53	9.223E-02
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	7.748E-02	39	78.57	9.571E-02
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	7.955E-02	40	80.61	9.946E-02
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	8.173E-02	41	82.65	1.035E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	8.403E-02	42	84.69	1.079E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	8.646E-02	43	86.73	1.127E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	8.904E-02	44	88.77	1.180E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	9.178E-02	45	90.82	1.237E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	9.470E-02	46	92.86	1.301E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	9.780E-02	47	94.90	1.371E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	1.011E-01	48	96.94	1.449E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	1.047E-01	49	98.98	1.537E-01
13	25.51	1.500E+00									

JUNCTION VOLUMES (CUFT)

JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09
2	2.04	1.585E+09
3	4.08	1.552E+09
4	6.12	1.519E+09
5	8.16	1.486E+09
6	10.20	1.453E+09
7	12.24	1.420E+09
8	14.29	1.387E+09
9	16.33	1.354E+09
10	18.37	1.321E+09
11	20.41	1.288E+09
12	22.45	1.255E+09
13	24.49	1.222E+09
14	26.53	1.189E+09
15	28.57	1.156E+09
16	30.61	1.123E+09
17	32.65	1.090E+09
18	34.69	1.057E+09
19	36.73	1.024E+09
20	38.78	9.905E+08
21	40.82	9.575E+08
22	42.86	9.245E+08
23	44.90	8.915E+08
24	46.94	8.585E+08
25	48.98	8.254E+08
26	51.02	5.116E+08
27	53.06	2.115E+08
28	55.10	2.061E+08
29	57.14	2.007E+08
30	59.18	1.952E+08
31	61.22	1.898E+08
32	63.26	1.844E+08
33	65.31	1.790E+08
34	67.35	1.736E+08
35	69.39	1.681E+08
36	71.43	1.627E+08
37	73.47	1.573E+08
38	75.51	1.358E+08
39	77.55	1.[illegible]E+08
40	79.59	1.[illegible]E+08
41	81.63	1.[illegible]E+08
42	83.67	1.[illegible]E+08
43	85.71	9.[illegible]E+07
44	87.75	9.[illegible]E+07
45	89.80	8.[illegible]E+07
46	91.84	8.[illegible]E+07
47	93.88	8.081E+07
48	95.92	7.656E+07
49	97.96	7.231E+07
50	100.00	7.018E+07

********** COMPUTED REAERATION RATES (1/DAY) **********

JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01
2	2.04	3.062E-01
3	4.08	3.062E-01
4	6.12	3.062E-01
5	8.16	3.062E-01
6	10.20	3.062E-01
7	12.24	3.062E-01
8	14.29	3.062E-01
9	16.33	3.062E-01
10	18.37	3.062E-01
11	20.41	3.062E-01
12	22.45	3.062E-01
13	24.49	3.062E-01
14	26.53	3.062E-01
15	28.57	3.062E-01
16	30.61	3.062E-01
17	32.65	3.062E-01
18	34.69	3.062E-01
19	36.73	3.062E-01
20	38.78	3.062E-01
21	40.82	3.062E-01
22	42.86	3.062E-01
23	44.90	3.062E-01
24	46.94	3.062E-01
25	48.98	3.062E-01
26	51.02	4.052E-01
27	53.06	5.174E-01
28	55.10	5.450E-01
29	57.14	5.749E-01
30	59.18	6.072E-01
31	61.22	6.425E-01
32	63.26	6.808E-01
33	65.31	7.227E-01
34	67.35	7.686E-01
35	69.39	8.190E-01
36	71.43	8.746E-01
37	73.47	9.360E-01
38	75.51	1.175E+00
39	77.55	1.434E+00
40	79.59	1.547E+00
41	81.63	1.673E+00
42	83.67	1.816E+00
43	85.71	1.977E+00
44	87.75	2.161E+00
45	89.80	2.372E+00
46	91.84	2.616E+00
47	93.88	2.899E+00
48	95.92	3.231E+00
49	97.96	3.623E+00
50	100.00	3.835E+00

STEADY STATE FLOW CONDITIONS

TOTAL INFLOWS = 1500.0 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 1500.0 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	1.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-1.500E+03	14	27.55	-1.500E+03	26	52.04	-1.500E+03	38	76.53	-1.000E+03
2	3.06	-1.500E+03	15	29.59	-1.500E+03	27	54.08	-1.500E+03	39	78.57	-1.000E+03
3	5.10	-1.500E+03	16	31.63	-1.500E+03	28	56.12	-1.500E+03	40	80.61	-1.000E+03
4	7.14	-1.500E+03	17	33.67	-1.500E+03	29	58.16	-1.500E+03	41	82.65	-1.000E+03
5	9.18	-1.500E+03	18	35.71	-1.500E+03	30	60.20	-1.500E+03	42	84.69	-1.000E+03
6	11.22	-1.500E+03	19	37.75	-1.500E+03	31	62.24	-1.500E+03	43	86.73	-1.000E+03
7	13.27	-1.500E+03	20	39.80	-1.500E+03	32	64.29	-1.500E+03	44	88.77	-1.000E+03
8	15.31	-1.500E+03	21	41.84	-1.500E+03	33	66.33	-1.500E+03	45	90.82	-1.000E+03
9	17.35	-1.500E+03	22	43.88	-1.500E+03	34	68.37	-1.500E+03	46	92.86	-1.000E+03

10	19.39	-1.500E+03	23	45.92	-1.500E+03	35	70.41	-1.500E+03	47	94.90	-1.000E+03
11	21.43	-1.500E+03	24	47.96	-1.500E+03	36	72.45	-1.500E+03	48	96.94	-1.000E+03
12	23.47	-1.500E+03	25	50.00	-1.500E+03	37	74.49	-1.500E+03	49	98.98	-1.000E+03
13	25.51	-1.500E+03									

STEADY STATE TDS INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS

JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 2.0000E+04 (PPM)

CONVERGENCE IN 601 CYCLES

AUTOSS - TEST PROBLEM

STEADY STATE TDS CONCENTRATIONS (PPM)

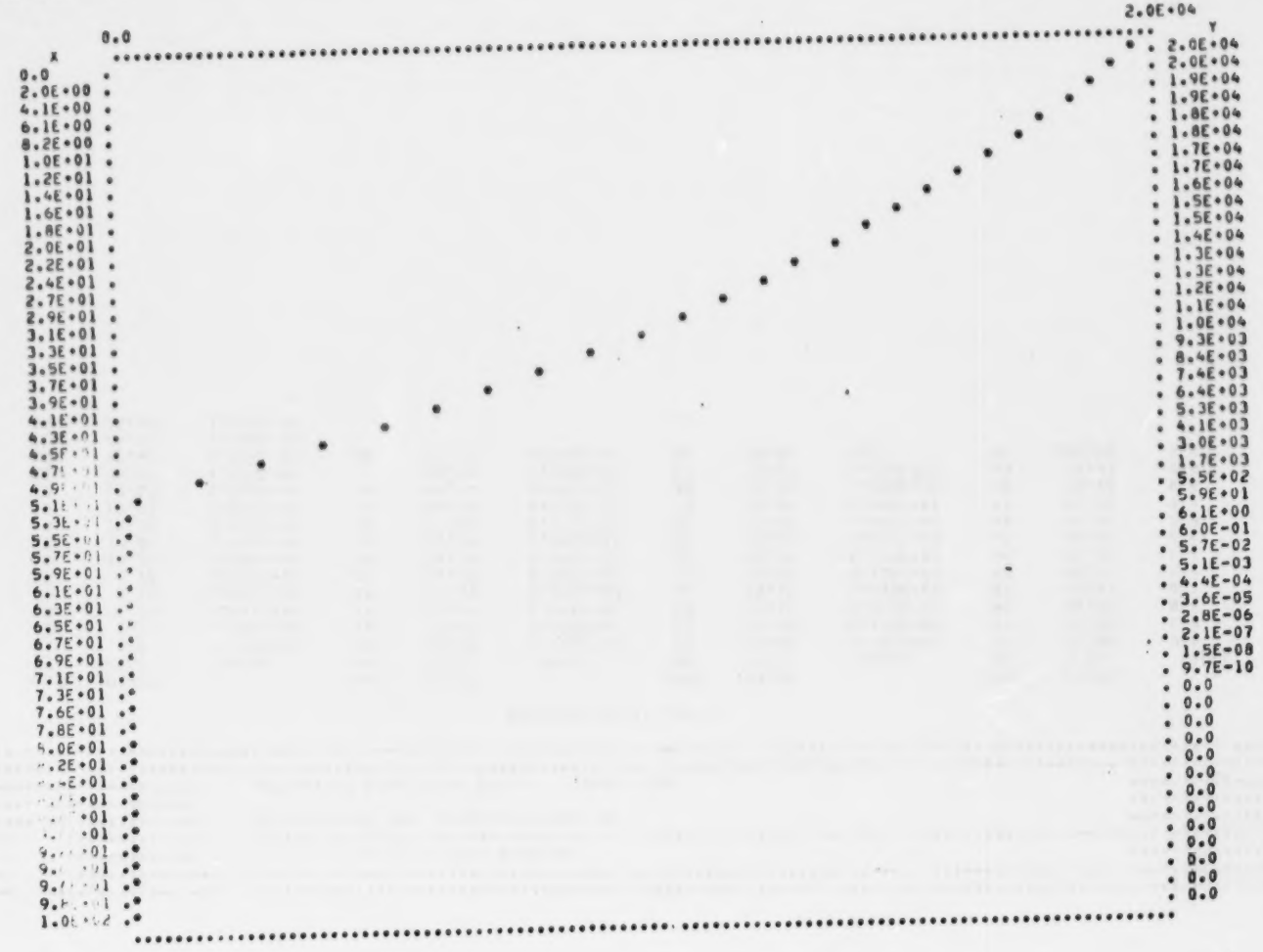
OUTFLOW AT DOWNSTREAM END = 1500.0 CFS

CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	1.186E+04	27	53.06	5.949E+01	39	77.55	0.0
2	2.04	1.956E+04	16	30.61	1.106E+04	28	55.10	6.125E+00	40	79.59	0.0
3	4.08	1.911E+04	17	32.65	1.021E+04	29	57.14	6.040E-01	41	81.63	0.0
4	6.12	1.864E+04	18	34.69	9.318E+03	30	59.18	5.699E-02	42	83.67	0.0
5	8.16	1.815E+04	19	36.73	8.380E+03	31	61.22	5.138E-03	43	85.71	0.0
6	10.20	1.764E+04	20	38.78	7.395E+03	32	63.26	4.419E-04	44	87.75	0.0
7	12.24	1.711E+04	21	40.82	6.359E+03	33	65.31	3.621E-05	45	89.80	0.0
8	14.29	1.655E+04	22	42.86	5.273E+03	34	67.35	2.822E-06	46	91.84	0.0
9	16.33	1.597E+04	23	44.90	4.137E+03	35	69.39	2.088E-07	47	93.88	0.0
10	18.37	1.536E+04	24	46.94	2.957E+03	36	71.43	1.465E-08	48	95.92	0.0
11	20.41	1.473E+04	25	48.98	1.749E+03	37	73.47	9.728E-10	49	97.96	0.0
12	22.45	1.406E+04	26	51.02	5.541E+02	38	75.51	0.0	50	100.00	0.0
13	24.49	1.336E+04									
14	26.53	1.263E+04									

Y= TDS CONCENTRATIONS (PPM)

X=RIVER MILE



APPENDIX B

AUTØQD - PROGRAM DESCRIPTION/OPERATING INSTRUCTIONS

GENERAL

AUTØQD and AUTØSS are very similar in their construction and their method of use. Only the main differences in operating procedure will be discussed. The reader should read the AUTØSS operating instructions first. The main differences in the operation of the models lie in the entering of computational data.

AUTØQD is written in the same language as AUTØSS and requires the same input/output devices. Machine storage requirement is 115K. Typical running time is 0.15 second (compute time) per day of simulation for a 150 section network. These times will vary depending on the computer used, the network used, the constituents being modelled, and the integration step.

PROGRAM LOGIC:

AUTØQD is also controlled by "program control cards". Their format is the same as in AUTØSS. The program control cards and their respective functions are:

Program Control Card (Cols. 1 thru 4)	Function
DATA	Same as AUTØSS
FLØW	Same as AUTØSS
CBØD	Directs the program to read in the input CBØD values and then compute CBØD for the specified period. Data cards follow

Program Control Card (Cols. 1 thru 4)	Function
NBØD	Directs the program to read the input NBØD values and compute NBØD for the specified period. Data cards follow.
DØ	Directs the program to read input CBØD, NBØD and DØ values and then compute CBØD, NBØD and DØ for the specified period. This is different from AUTØSS, because CBØD and NBØD are done simultaneously with DØ. Data cards follow.
HALT	Same as AUTØSS
Any 4-letter word except the above	The program assumes this is the name of a conservative parameter. Input values are read, and the concentrations are computed for the specified period.

DATA DESCRIPTION

The data for AUTØQD have the same characteristics as the data for AUTØSS. The physical and network data is identical for both programs. The computational data is the same except additional information is needed for time keeping:

1. Beginning and Ending data of period (day-month-year), e.g. (1-10-1971).
2. Print period (days): This number specifies the number of days between quality print outs. If a period consists of 50 days and the solution is to be printed every 5 days, the print period would be 5. If the print period is omitted the program will assign a value of 1 day.

3. Integration time step (hours): This is the integration step used in the program. It must be less than or equal to 24 and an even divisor of 24. If no value is entered the program will compute its own time step. (See model development, AUTØQD solution.)

The meaning of initial concentrations changes slightly in AUTØQD In AUTØQD they are considered as starting concentrations. Since continuous simulation can be done with AUTØQD the starting concentrations are updated every integration step (time step). Concentrations at the end of one period become the starting concentrations for next period.

ENTERING DATA

Data is entered under the direction of a program control card, except the run title and network data. As in AUTØSS variables are zeroed or set to default values before data is entered or computed.

I. Run title card

Same as AUTØSS

II. Network card

Same as AUTØSS

III. Entering physical data

Same as AUTØSS

IV. Entering computational data

A. Flows

1. The program control card FLØW precedes the data cards.

2. Immediately after the program control card is the timing card which specifies the dates of the flow period to be entered:

   Beginning month number: cols. 1- 2 (right hand justify, no decimal point) (1-12)

   Beginning day number : cols. 4- 5 (right hand justify, no decimal point)

   Beginning year : cols. 7-10

   Ending month number : cols. 16-17 (right hand justify, no decimal point)

   Ending day number : cols. 19-20 (right hand justify, no decimal point

   Ending year : cols. 22-25

3. Next are the data cards in the following format:

   River mile of data point: cols. 11-20 (include a decimal point)

   Inflow (cfs) : cols. 21-30 (include a decimal point)

   Diversion (cfs) : cols. 31-40 (include a decimal point)

4. After the data cards a card with STØP punched in the first 4 columns is placed in the deck.

B. CBØD

1. The program control card CBØD precedes the data cards.

2. Immediately after the program control card is a card which specifies the dates of the period, the print interval, and the integration step (optional):

Beginning month number	: cols. 1- 2	(right hand justify, no decimal point)
Beginning day number	: cols. 4- 5	(right hand justify, no decimal point)
Beginning year	: cols. 7-10	(right hand justify, no decimal point)
Ending month number	: cols. 16-17	(right hand justify, no decimal point)
Ending day number	: cols. 19-20	(right hand justify, no decimal point)
Ending year	: cols. 22-25	
Print interval (optional)	: cols. 31-35	(right hand justify, no decimal point)
Integration step (optional)	: cols. 41-50	(include a decimal point)

3. Next are the data cards in the following format:

   (Note: If it is desired to fix (establish a boundary condition) the concentration of a point, the word FIXED is punched in the first 5 columns of that data card; otherwise, these columns are left blank.)

River mile of data point:	cols. 11-20	(include a decimal point)
Inflow at data point	: cols. 21-30	(include a decimal point)
Inflow concentration at data point	: cols. 31-40	(include a decimal point)
Fixed concentration at data point (if FIXED option is chosen)	: cols. 41-50	(include a decimal point)

4. After all data cards are entered, a card with STØP punched in the first 4 columns is placed in the deck.

C. NBØD

1. The program control card NBØD precedes the data cards.
2. The rest of the cards have the same format as CBØD.

D. Conservative constituents

1. The program control card with the constituent name on it precedes the data cards.
2. The rest of the cards have the same format as for CBØD.

E. DØ

1. The program control card DØ precedes the data cards.
2. The next card is the same as CBØD.
3. Next are the data cards in the following format:

River mile of data point	:	cols. 11-20 (include a decimal point)
Inflow at data point	:	cols. 21-30 (include a decimal point)
CBØD inflow concentration	:	cols. 31-37 (include a decimal point)
NBØD inflow concentration	:	cols. 38-44 (include a decimal point)
DØ inflow concentration	:	cols. 45-51 (include a decimal point)
CBØD fixed concentration (if desired)	:	cols. 52-58 (include a decimal point)
NBØD fixed concentration (if desired)	:	cols. 59-65 (include a decimal point)
DØ fixed concentration (if desired)	:	cols. 66-72 (include a decimal point)

4. After all data cards are entered a card with STØP punched in the first 4 columns is placed in the deck.

After all the data has been entered the HALT program control card is placed in the deck.

OUTPUT DESCRIPTION

The output for AUTØQD is also controlled by the program control cards and is referenced to river miles as well as to channels or junctions.

The first items printed are a title and listing of the general network data. Included here is the run title, mile of upstream and downstream end, mile of fall line, and the number of sections.

Each time physical data is entered, it is printed out under the heading "Estuary/Stream Data".

When a flow condition is entered two groups of information are printed. Under the heading "Depth or Velocity Dependent Variables for the Flow Period Month, Day, Year thru Month, Day, Year", the following are printed:

1. Cross-sectional Areas
2. Channel Depths
3. Channel Velocities
4. Junction Volumes
5. Computed Reaeration Rates (if the compute option is used)

Under the heading "Flow Conditions for the Period Month, Day, Year, thru Month, Day, Year" the inflows, diversions and channel flows are printed. The same sign convention is used as in AUTØSS.

When a constituent control card is encountered, two other groups are printed. Under the heading (Constituent Name) "Input Concentrations for Month, Day, Year thru Month, Day, Year: the input concentrations for the

period are printed. The solutions are printed under the heading of the run title and (Constituent Name) "Concentrations for the Period (Month, Day, Year) thru (Month, Day, Year)" at interval specified.

In addition to the regular output, error messages may be printed. These are the same as AUTØSS except there are no zero divisor messages.

DATA CODES FOR PHYSICAL DATA

Same as AUTØSS

RUNNING TIPS

The same general rules apply to AUTØQD as in AUTØSS; however, there are some differences due to the different types of solutions.

1. DATA should be the first control card for the same reasons as for AUTØSS
2. FLØW is the second control card. The dates entered under the FLØW card have no computational significance; they are for the user's reference. A flow condition will continue to be used in the program until it is replaced.
3. CBØD and/or NBØD are run simultaneously with DØ. They can be run separately if desired, however, they will have no effect on the DØ budget if they are.
4. The starting (initial) concentrations for a constituent are updated every integration step.

A general example of control card setup is given below (see the end of this appendix for a specific example problem)

PROBLEM STATEMENT

Given flow condition 1, which represents flow from 1/01/72 to 2/01/72, and flow condition 2, which represents flow from 2/02/72 to 3/01/72. Run TDS with 4 downstream boundary conditions (1/01/72-1/15/72, 1/16/72-2/01/72, 2-02/72-2/15/72, 2-16/72-3/01/72) print out values every 2 days. Run CBØD, NBØD and DØ with 4 different input conditions (same dates as TDS) print solutions every day, and let the program compute the time step.

The arrangement of the control cards would be:

```
                DATA  -  enter physical data
Flow Condition # 1
                FLØW  -  (1/01/72 - 2/01/72)
                TDS   -  (1/01/72 - 1/15/72)  Print interval = 2
                DØ    -  (1/01/72 - 1/15/72)  Print interval = 1
                TDS   -  (1/16/72 - 2/01/72)  Print interval = 2
                DØ    -  (1/16/72 - 2/01/72)  Print interval = 1
Flow Condition # 2
                FLØW  -  (2/02/72 - 3/01/72)
                TDS   -  (2/02/72 - 2/15/72)  Print interval = 2
                DØ    -  (2/02/72 - 2/15/72)  Print interval = 1
                TDS   -  (2/01/72 - 3/01/72)  Print interval = 2
                DØ    -  (3/16/72 - 3/01/72)  Print interval = 1
                HALT
```

AUTØQD VARIABLE GLOSSARY

Variable	Definition
A (N)	cross-sectional area of channel N
A1(N) A2(N) A3(N)	flow equation coefficients at channel N
AS(J)	surface area of junction J
C(J)	concentration at junction J, can be any parameter
CBDIN(J)	CBØD input concentration at junction J
CBØD(J)	CBØD concentration at junction J
CIN(J)	input concentration at junction J can be any parameter
CS(J)	conservative constituent concentration
DELT	timestep (sec.)
DELT2	half timestep (sec.)
DELTD	timestep (hrs.)
DK1(J)	CBØD decay rate at junction J
DK2(J)	NBØD decay rate at junction J
DØS(J)	oxygen saturation concentration at junction J
EVAP(J)	net evaporation minus rainfall at junction J
IDAYB	beginning day
IDAYE	ending day
IMØB	beginning month
IYRB	beginning year

IYRB	beginning year
IYRE	ending year
K2FL	flag to tell if reaeration rates are to be computed
LALPHA(K)	run title
MFS(K,I)	I^{th} fixed parameter at K^{th} fixed junction
NBEG	period beginning day number
NC	number of channels
NDAYS	number of days in a period
NEND	period ending day number
NFS(K)	K^{th} fixed junction number
NJ	number of junctions
NØJFX	number of fixed junctions
NPRT	print interval
NQCYC	number of timesteps per day
NRD	card reader unit number
NSES	number of sections
NWR	line printer unit number
ØXIN(J)	DØ input concentrations at junction J
ØXY(J)	DØ concentration at junction J
PHØTØ(J)	photosynthesis minus respiration rate at junction J
Q(N)	flow in channel N
QIN(J)	inflow at junction J
QØUT(J)	diversion at junction J

REAIR(J)	reaeration coefficient at junction J
RMC(N)	river mile of channel N
RMDWN	downstream river mile
RMFR	river mile of fall line
RMJ(J)	river mile of junction J
RMUP	upstream river mile
SEDMT(J)	sediment uptake rate at junction J
TEMP(J)	water temperature at junction J
V(N)	velocity in channel N
VØL(J)	volume of junction J
WIDTH(N)	width of channel N
XCMAS(J)	CBØD mass in junction J
XLEN	channel length in feet
XMASS(J)	constituent mass in junction J
XMIL	channel length in miles
XNDIN(J)	NBØD input concentration at junction J
XNMAS(J)	NBØD mass in junction J
XNØD(J)	NBØD concentration at junction J
XØMAS(J)	DØ mass in junction J
Z(N)	dispersion coefficient in channel N

SUBROUTINE DESCRIPTIONS

Following is a brief description of each subroutine of AUTØQD

MAIN BRANCH

Same as AUTØSS

SETUP

Same as AUTØSS

NETDAT

Same as AUTØSS

FLØWS

Same as AUTØSS, except the dates of the period are also read in

FLØCMP

Same as AUTØSS

VAULIN

The dates of the quality period, the print interval and time step (optional) are read. In addition, the quality inputs are read and assigned to the proper junction. DØ is not considered here. If more than one input is read in for a junction, they are combined according to their respective inflows and concentrations. Junctions may also be fixed. Conservative constituents, CBØD and NBØD, may be entered here.

VALCMP

The quality equations are integrated over the period specified in VAULIN. The concentrations are printed at the specified intervals (print interval).

CDERIV

The quality derivatives are evaluated. This routine is called from VALCMP.

VDØIN

The period dates, print interval and time step are read, as in VALCMP. The input CBØD, NBØD and DØ concentrations are read. The DØ title for this quality output is printed.

VDØCP

The CBØD, NBØD and DØ equations are integrated over the period specified in VDØIN, and the solutions are printed at the specified interval.

ØDERIV

The CBØD, NBØD and DØ derivatives are evaluated.

JKFND

Same as AUTØSS

SERIAL

Converts a date (month, day, year) into a corresponding day number.

TABU

Same as AUTØSS

INTER

Same as AUTØSS

CALEN

Converts a day number into a corresponding (month, day, year).

ØUTGØ

Same as AUTØSS

PROGRAM LISTING

Following is a listing of program AUTØQD:

```
C*********************************************************************
C*********************************************************************
C*********                                                   **********
C*********    PROGRAM AUTOQD - QUASI-DYNAMIC WATER QUALITY   ***********
C*********                                                   ***********
C*********************************************************************
C*********************************************************************
C*********                                                   ***********
C*********    WRITTEN BY R.L. CRIM AND N.L. LOVELACE         ***********
C*********                                                   ***********
C*********    ENVIRONMENTAL PROTECTION AGENCY, REGION III    ***********
C*********    ANNAPOLIS FIELD OFFICE                         ***********
C*********    TECHNICAL DEVELOPMENT SECTION                  ***********
C*********    ANNAPOLIS SCIENCE CENTER, ANNAPOLIS, MD. 21401 ***********
C*********    PHONE: 301-268-5038 OR 202-261-2410            ***********
C*********                                                   ***********
C*********************************************************************
C*********************************************************************
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DATA LBD/4HCBOD/,LND/4HNBOD/,LO/4HDO  /,LSTO/4HSTOP/,
     1     LJU/4HJUNC/,LCH/4HCHAN/,LFX/4HFIXE/,LFLO/4HFLOW/,
     2     LDATA/4HDATA/,LHALT/4HHALT/
      LCBD=LBD
      LNBD=LND
      LDO=LO
```

```
      LSTOP=LSTO
      LVAR1=LJU
      LVAR2=LCH
      LFIXE=LFX
      NRD=1
      NWR=6
      NVT=0
      READ(NRD,10)(LALPHA(K),K=1,20)
   10 FORMAT(20A4)
      READ(NRD,20)RMDWN,RMUP,RMFR,NSECS
   20 FORMAT(3F10.0,I10)
      WRITE(NWR,30)
   30 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,13X,3HAAA,11X,3HUUU,9X,3H
     1UUU,5X,15(1HT),7X,11(1HO),9X,11(1HQ),7X,13(1HD),/,1H ,12X,5HAAAAA,
     210X,3HUUU,9X,3HUUU,5X,15(1HT),6X,13(1HO),7X,13(1HQ),6X,14(1HD),/,1
     3H ,11X,7(1HA),9X,3HUUU,9X,3HUUU,5X,15(1HT),5X,15(1HO),5X,15(1HQ),5
     4X,15(1HD),/,1H ,10X,3HAAA,3X,3HAAA,8X,3HUUU,9X,3HUUU,11X,3HTTT,11X
     5,3HOOO,9X,3HOOO,
     6        5X,3HQQQ,9X,3HQQQ,5X,3HDDD,9X,3HDDD,/,1H ,9X,3HAAA,5X,3HAAA
     7,7X,3HUUU,9X,3HUUU,11X,3HTTT,11X,3HOOO,9X,3HOOO,5X,3HQQQ,9X,3HQQQ,
     85X,3HDDD,9X,3HDDD,/,1H ,8X,3HAAA,7X,3HAAA,6X,3HUUU,9X,3HUUU,11X,3H
     9TTT,11X,3HOOO,9X,3HOOO,5X,3HQQQ,5X,7HQQQ QQQ,5X,3HDDD,9X,3HDDD )
      WRITE(NWR,40)
   40 FORMAT(1H ,7X,15(1HA),5X,3HUUU,9X,3HUUU,11X,3HTTT,11X,3HOOO,9X,3HO
     100,5X,3HQQQ,6X,6HQQQQQQ,5X,3HDDD,9X,3HDDD,/,1H ,7X,15(1HA),5X,15(1
     2HU),11X,3HTTT,11X,15(1HO),5X,15(1HQ),5X,15(1HD),/,1H ,7X,3HAAA,9X,
     33HAAA,6X,13(1HU),12X,3HTTT,12X,13(1HO),7X,14(1HQ),5X,14(1HD),/,1H
     4,7X,3HAAA,9X,3HAAA,7X,11(1HU),13X,3HTTT,13X,11(1HO),9X,13(1HQ),5X,
     513(1HD),/,1H ,130(1H*),/,1H ,130(1H*) )
      WRITE(NWR,50)(LALPHA(K),K=1,20),RMDWN,RMUP,RMFR,NSECS
   50 FORMAT(1H0,20(1H*),5X,33HQUASI-DYNAMIC WATER QUALITY MODEL,/,1H ,2
     10(1H*),/,1H ,20(1H*),5X,14HRUN TITLE.....,20A4,/,1H ,20(1H*),/,1H
     2,20(1H*),/,1H ,20(1H*),5X,18HBASIC NETWORK DATA,/,1H ,20(1H*),5X,3
     31HRIVER MILE AT DOWNSTREAM END...,F10.2,/,1H ,20(1H*),5X,31HRIVER
     4MILE AT UPSTREAM END.....,F10.2,/,1H ,20(1H*),5X,31HRIVER MILE OF
```

```
     5FALL LINE.........,F10.2,/,1H ,20(1H*),5X,31HNUMBER OF SECTIONS....
     6.........,I10 )
      CALL SETUP
1000  READ(NRD,10)LTYPE
      IF(LTYPE.EQ.LHALT)GO TO 2000
      IF(LTYPE.NE.LDATA)GO TO 60
      CALL NETDAT
      GO TO 1000
  60  IF(LTYPE.NE.LCBD)GO TO 80
      DO 70 J=1,NJ
      C(J)=CBOD(J)
  70  CONTINUE
      CALL VAULIN
      CALL VALCMP
      DO 75 J=1,NJ
      CBOD(J)=C(J)
  75  CONTINUE
      GO TO 1000
  80  IF(LTYPE.NE.LNBD)GO TO 100
      DO 90 J=1,NJ
      C(J)=XNOD(J)
  90  CONTINUE
      CALL VAULIN
      CALL VALCMP
      DO 95 J=1,NJ
      XNOD(J)=C(J)
  95  CONTINUE
      GO TO 1000
 100  IF(LTYPE.NE.LDO)GO TO 110
      CALL VDOIN
      CALL VDOCP
      GO TO 1000
 110  IF(LTYPE.NE.LFLO)GO TO 120
      CALL FLOWS
      GO TO 1000
```

```
      DO 130 J=1,NJ
        C(J)=CS(J)
  130 CONTINUE
        CALL VAULIN
        CALL VALCMP
          DO 135 J=1,NJ
            CS(J)=C(J)
  135 CONTINUE
        GO TO 1000
 2000 STOP
        END
```

```
      SUBROUTINE SETUP
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      NC=NSECS
      NJ=NSECS+1
      XMIL=(RMUP-RMDWN)/FLOAT(NC)
      XLEN=XMIL*5285.0
      RMJ(1)=RMDWN
      DO 10 J=2,NJ
      RMJ(J)=RMJ(J-1)+XMIL
   10 CONTINUE
      RMC(1)= RMDWN+(XMIL/2.0)
      DO 20 N=2,NC
      RMC(N)=RMC(N-1)+XMIL
   20 CONTINUE
      DO 30 J=1,NJ
      QIN(J)=0.0
      QOUT(J)=0.0
      Q(J)=0.0
      A(J)=0.0
      Z(J)=0.0
      XNDIN(J)=0.0
      CBDIN(J)=0.0
      OXIN(J)=0.0
      CIN(J)=0.0
      C(J)=0.0
```

```
      REAIR(J)=0.0
      VOL(J)=0.0
      PHOTO(J)=0.0
      EVAP(J)=0.0
      AS(J)=0.0
      SEDMT(J)=0.0
      DOS(J)=0.0
      V(J)=0.0
      WIDTH(J)=0.0
      A1(J)=0.0
      A2(J)=0.0
      A3(J)=0.0
      TEMP(J)=20.0
      DK1(J)=0.0
      DK2(J)=0.0
      CBOD(J)=0.0
      XNOD(J)=0.0
      OXY(J)=0.0
      CS(J)=0.0
      NFS(J)=0
      XMASS(J)=0.0
      XNMAS(J)=0.0
      XCMAS(J)=0.0
      XOMAS(J)=0.0
      DO 30 K=1,3
      MFS(J,K)=0
   30 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE NETDAT
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DATA LA1/4HA1  /,LA2/4HA2  /,LA3/4HA3  /,LWIDT/4HWIDT/,
     1     LVEL/4HVELO/,LTEMP/4HTEMP/,LVAP/4HEVAP/,LPHOTO/4HPHOT/,
     2     LSEDMT/4HSEDI/,LDISP/4HDISP/,LDK1/4HCDEC/,LDK2/4HNDEC/,
     3     LREAI/4HREAE/,LDOS/4HSATD/,LINIT/4HINIT/,LOXY/4HDO  /,
     4     LCSA/4HC-SA/,LCK2/4HC-RE/
      DATA VAPFAC/1.86224E07/,CVFAC/3.28075E00/
      DIMENSION X(250),Y(250)
      K2FL=0
      WRITE(NWR,10)
   10 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,35(1H*),61X,34(1H*),/,1H
     1,35(1H*),6X,49HE S T U A R Y / S T R E A M   I N P U T   D A T A,
     26X,34(1H*),/,1H ,35(1H*),61X,34(1H*),/,1H ,130(1H*),/,1H ,130(1H*)
     3)
 1000 READ(NRD,20)LABEL,LCST,NPTS
   20 FORMAT(2A4,2X,I5)
      IF(LABEL.EQ.LSTOP)GO TO 5000
      IF(NPTS.EQ.0) GO TO 45
      DO 40 J=1,NPTS
      READ(NRD,30)J,X(J),Y(J)
   30 FORMAT(I5,5X,2F10.0)
   40 CONTINUE
   45 IF(LABEL.NE.LA1) GO TO 60
      CALL INTER(A1,NC,X,Y,NPTS,RMC)
```

```
      SUBROUTINE NETDAT
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DATA LA1/4HA1  /,LA2/4HA2  /,LA3/4HA3  /,LWIDT/4HWIDT/,
     1     LVEL/4HVELO/,LTEMP/4HTEMP/,LVAP/4HEVAP/,LPHOTO/4HPHOT/,
     2     LSEDMT/4HSEDI/,LDISP/4HDISP/,LDK1/4HCDEC/,LDK2/4HNDEC/,
     3     LREAI/4HREAE/,LDOS/4HSATD/,LINIT/4HINIT/,LOXY/4HDO  /,
     4     LCSA/4HC-SA/,LCK2/4HC-RE/
      DATA VAPFAC/1.86224E07/,CVFAC/3.28075E00/
      DIMENSION X(250),Y(250)
      K2FL=0
      WRITE(NWR,10)
   10 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,35(1H*),61X,34(1H*),/,1H
     1,35(1H*),6X,49HE S T U A R Y / S T R E A M   I N P U T   D A T A,
     26X,34(1H*),/,1H ,35(1H*),61X,34(1H*),/,1H ,130(1H*),/,1H ,130(1H*)
     3)
 1000 READ(NRD,20)LABEL,LCST,NPTS
   20 FORMAT(2A4,2X,I5)
      IF(LABEL.EQ.LSTOP)GO TO 5000
      IF(NPTS.EQ.0) GO TO 45
      DO 40 J=1,NPTS
      READ(NRD,30)J,X(J),Y(J)
   30 FORMAT(I5,5X,2F10.0)
   40 CONTINUE
   45 IF(LABEL.NE.LA1) GO TO 60
      CALL INTER(A1,NC,X,Y,NPTS,RMC)
```

```
      WRITE(NWR,50)
   50 FORMAT(1H0,20(1H*),5X,32HA1 COEFFICIENT FOR FLOW EQUATION,5X,20(1H
     1*) )
      CALL OUTGO(LVAR2,NC,RMC,A1)
      GO TO 1000
   60 IF(LABEL.NE.LA2) GO TO 80
      CALL INTER(A2,NC,X,Y,NPTS,RMC)
      WRITE(NWR,70)
   70 FORMAT(1H0,20(1H*),5X,32HA2 COEFFICIENT FOR FLOW EQUATION,5X,20(1H
     1*) )
      CALL OUTGO(LVAR2,NC,RMC,A2)
      GO TO 1000
   80 IF(LABEL.NE.LA3) GO TO 100
      CALL INTER(A3,NC,X,Y,NPTS,RMC)
      WRITE(NWR,90)
   90 FORMAT(1H0,20(1H*),5X,79HA3 COEFFICIENT FOR FLOW EQUATION - RERESE
     1NTS DEPTH OF FLOW IF A1 AND/OR A2 ARE ,5X,20(1H*),/,1H ,20(1H*),5X
     2,27HNOT SPECIFIED (OR ARE ZERO),57X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,A3)
      GO TO 1000
  100 IF(LABEL.NE.LWIDT)GO TO 120
      CALL INTER(WIDTH,NC,X,Y,NPTS,RMC)
      WRITE(NWR,110)
  110 FORMAT(1H0,20(1H*),5X,19HCHANNEL WIDTHS (FT),5X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,WIDTH)
      AS(1)=WIDTH(1)*XLEN
      AS(NJ)=WIDTH(NJ)*XLEN
      DO 112 J=2,NC
      AS(J)=XLEN*0.5*(WIDTH(J)+WIDTH(J-1))
  112 CONTINUE
      WRITE(NWR,114)
  114 FORMAT(1H0,20(1H*),5X,29HJUNCTION SURFACE AREAS (SQFT),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,AS)
      GO TO 1000
  120 IF(LABEL.NE.LVEL) GO TO 150
```

```
      NVT=1
      CALL INTER(V,NC,X,Y,NPTS,RMC)
      DO 130 N=1,NC
      IF(RMC(N).GT.RMFR) V(N)=0.0
  130 CONTINUE
      WRITE(NWR,140)
  140 FORMAT(1H0,20(1H*),5X,41HAVERAGE CHANNEL TIDAL VELOCITIES (FT/SEC)
     1,5X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,V)
      GO TO 1000
  150 IF(LABEL.NE.LTEMP) GO TO 170
      CALL INTER(TEMP,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,160)
  160 FORMAT(1H0,20(1H*),5X,35HJUNCTION WATER TEMPERATURES (DEG-C),5X,20
     1(1H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,TEMP)
      GO TO 1000
  170 IF(LABEL.NE.LVAP) GO TO 200
      CALL INTER(EVAP,NJ,X,Y,NPTS,RMJ,EVAP)
      WRITE(NWR,180)
  180 FORMAT(1H0,20(1H*),5X,34HNET EVAPORATION - RAINFALL (IN/MO),5X,20(
     11H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,EVAP)
      DO 190 J=1,NJ
      EVAP(J)=EVAP(J)/VAPFAC
  190 CONTINUE
      GO TO 1000
  200 IF(LABEL.NE.LPHOTO) GO TO 230
      CALL INTER(PHOTO,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,210)
  210 FORMAT(1H0,20(1H*),5X,61HAVERAGE DAILY PHOTOSYNTHESIS-RESPIRATION
     1RATE (GM O2/SQM/DAY),5X,20(1H*) )
      CALL OUTGO(LVAR1,NJ,RMJ,PHOTO)
      DO 220 J=1,NJ
      PHOTO(J)=PHOTO(J)*CVFAC/86400.0
```

```
220 CONTINUE
    GO TO 1000
230 IF(LABEL.NE.LSEDMT) GO TO 260
    CALL INTER(SEDMT,NJ,X,Y,NPTS,RMJ)
    WRITE(NWR,240)
240 FORMAT(1H0,20(1H*),5X,42HOXYGEN UPTAKE OF SEDIMENTS (GM O2/SQM/DAY
   1),5X,20(1H*) )
    CALL OUTGO(LVAR1,NJ,RMJ,SEDMT)
    DO 250 J=1,NJ
    SEDMT(J)=SEDMT(J)*CVFAC/86400.0
250 CONTINUE
    GO TO 1000
260 IF(LABEL.NE.LDISP) GO TO 280
    CALL INTER(Z,NC,X,Y,NPTS,RMC)
    WRITE(NWR,270)
270 FORMAT(1H0,20(1H*),5X,34HDISPERSION COEFFICIENTS (SQFT/SEC),5X,20(
   11H*) )
    CALL OUTGO(LVAR2,NC,RMC,Z)
    GO TO 1000
280 IF(LABEL.NE.LDK1)GO TO 310
    CALL INTER(DK1,NJ,X,Y,NPTS,RMJ)
    DO 285 J=1,NJ
    DK1(J)=DK1(J)*1.047**(TEMP(J)-20.0)
285 CONTINUE
    WRITE(NWR,290)
290 FORMAT(1H0,20(1H*),5X,52HCBOD DECAY RATES CORRECTED TO STREAM TEMP
   1S - (1/DAY),5X,20(1H*))
    CALL OUTGO(LVAR1,NJ,RMJ,DK1)
    DO 300 J=1,NJ
    DK1(J)=DK1(J)/86400.0
300 CONTINUE
    GO TO 1000
310 IF(LABEL.NE.LDK2)GO TO 340
    CALL INTER(DK2,NJ,X,Y,NPTS,RMJ)
    DO 315 J=1,NJ
```

```
      DK2(J)=DK2(J)*1.015**(TEMP(J)-20.0)
  315 CONTINUE
      WRITE(NWR,320)
  320 FORMAT(1H0,20(1H*),5X,52HNBOD DECAY RATES CORRECTED TO STREAM TEMP
     1S - (1/DAY),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DK2)
      DO 330 J=1,NJ
      DK2(J)=DK2(J)/86400.0
  330 CONTINUE
      GO TO 1000
  340 IF(LABEL.NE.LREAI) GO TO 370
      CALL INTER(REAIR,NJ,X,Y,NPTS,RMJ)
      DO 345 J=1,NJ
      REAIR(J)=REAIR(J)*1.024**(TEMP(J)-20.0)
  345 CONTINUE
      WRITE(NWR,350)
  350 FORMAT(1H0,20(1H*),5X,58HINPUT REAERATION RATES CORRECTED TO STREA
     1M TEMPS - (1/DAY),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,REAIR)
      DO 360 J=1,NJ
      REAIR(J)=REAIR(J)/86400.0
  360 CONTINUE
      GO TO 1000
  370 IF(LABEL.NE.LDOS) GO TO 390
      CALL INTER(DOS,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,380)
  380 FORMAT(1H0,20(1H*),5X,46HINPUTED OXYGEN SATURATION CONCENTRATIONS
     1(PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DOS)
      GO TO 1000
  390 IF(LABEL.NE.LINIT) GO TO 470
      IF(LCST.NE.LCBD)GO TO 410
      CALL INTER(CBOD,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,400)
  400 FORMAT(1H0,20(1H*),5X,33HINITIAL CBOD CONCENTRATIONS (PPM),5X,20(1
```

```
     1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,CBOD)
      GO TO 1000
  410 IF(LCST.NE.LNBD)GO TO 430
      CALL INTER(XNOD,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,420)
  420 FORMAT(1H0,20(1H*),5X,33HINITIAL NBOD CONCENTRATIONS (PPM),5X,20(1
     1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,XNOD)
      GO TO 1000
  430 IF(LCST.NE.LOXY) GO TO 450
      CALL INTER(OXY,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,440)
  440 FORMAT(1H0,20(1H*),5X,45HINITIAL DISSOLVED OXYGEN CONCENTRATIONS (
     1PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,OXY)
      GO TO 1000
  450 CALL INTER(CS,NJ,X,Y,NPTS,RMJ)
      WRITE(NWR,460)LCST
  460 FORMAT(1H0,20(1H*),5X,8HINITIAL ,A4,21H CONCENTRATIONS (PPM),5X,20
     1(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,CS)
      GO TO 1000
  470 IF(LABEL.NE.LCSA)GO TO 500
      DO 480 J=1,NJ
      DOS(J)=14.62-0.367*TEMP(J)+0.0045*(TEMP(J)**2.0)
  480 CONTINUE
      WRITE(NWR,490)
  490 FORMAT(1H0,20(1H*),5X,47HCOMPUTED OXYGEN SATURATION CONCENTRATIONS
     1 (PPM),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,DOS)
      GO TO 1000
  500 IF(LABEL.NE.LCK2)GO TO 510
      K2FL=1
      GO TO 1000
```

```
  510 WRITE(NWR,520)LABEL
  520 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H ,20(1H?),5X,10HDATA CODE ',
     1A4,36H DOES NOT EXIST - PROGRAM TERMINATES,/,1H ,130(1H?),/,1H ,
     2130(1H?))
      STOP
 5000 RETURN
      END
```

```
      SUBROUTINE FLOWS
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      DO 10 J=1,NJ
      QIN(J)=0.0
      QOUT(J)=0.0
      Q(J)=0.0
   10 CONTINUE
      READ(NRD,15)IMOB,IDAYB,IYRB,IMOE,IDAYE,IYRE
   15 FORMAT(I2,1X,I2,1X,I4,5X,I2,1X,I2,1X,I4)
      IYB=IYRB-1900
      IYE=IYRE-1900
      CALL SERIAL(IDAYE,IMOE,IYE,NEND)
      CALL SERIAL(IDAYB,IMOB,IYB,NBEG)
      NDAYS=NEND-NBEG+1
   20 READ(NRD,30)LABEL,DIST,QN,QAUT
   30 FORMAT(A4,6X,3F10.0)
      IF(LABEL.EQ.LSTOP)GO TO 40
      JUNC=JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      QIN(JUNC)=QIN(JUNC)+QN
```

```
      QOUT(JUNC)=QOUT(JUNC)+QAUT
      GO TO 20
   40 Q(NC)=-QIN(NJ)+QOUT(NJ)+EVAP(NJ)*AS(NJ)
      DO 50 N=2,NC
      NCHAN=NJ-N
      NCP=NCHAN+1
      Q(NCHAN)=Q(NCP)-QIN(NCP)+QOUT(NCP)+EVAP(NCP)*AS(NCP)
   50 CONTINUE
      CALL FLOCMP
      SUMIN=0.0
      SUMOUT=0.0
      DO 70 J=1,NJ
      SUMIN=SUMIN+QIN(J)
      SUMOUT=SUMOUT+QOUT(J)
      IF(EVAP(J).LT.0.0)GO TO 60
      SUMOUT=SUMOUT+EVAP(J)*AS(J)
      GO TO 70
   60 SUMIN=SUMIN-EVAP(J)*AS(J)
   70 CONTINUE
      IF(SUMOUT.GT.SUMIN)GO TO 80
      QOUT(1)=QOUT(1)+SUMIN-SUMOUT
      GO TO 90
   80 QIN(1)=QIN(1)+SUMOUT-SUMIN
   90 WRITE(NWR,100)LMN(IMOB),IDAYB,IYRB,LMN(IMOE), IDAYE,IYRE,NDAYS,
     *                SUMIN,SUMOUT,QOUT(1)
  100 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),5X,21HFLOW CONDIT
     1IONS FOR  ,A4,1X,I2,2H, ,I4,1X,4HTHRU,1X,A4,1X,I2,2H, ,I4,22X,25(1
     2H*),/,1H ,25(1H*),80X,25(1H*),/,1H ,25(1H*),5X,32HNUMBER OF DAYS I
     3N THIS PERIOD = ,I4,39X,25(1H*),/,1H ,25(1H*),5X,16HTOTAL INFLOWS
     4= ,F10.2,4H CFS,45X,25(1H*),/,1H ,25(1H*),5X,19HTOTAL DIVERSIONS =
     5 ,F10.2,4H CFS,42X,25(1H*),/,1H ,25(1H*),5X,33HOUTFLOW AT DOWNSTRE
     6AM JUNCTION = ,F10.2,4H CFS,28X,25(1H*),/,1H ,130(1H*),/,1H ,130(1
     7H*))
      WRITE(NWR,110)
  110 FORMAT(1H0,20(1H*),5X,13HINFLOWS (CFS),5X,20(1H*))
```

```
      CALL OUTGO(LVAR1,NJ,RMJ,QIN)
      WRITE(NWR,120)
  120 FORMAT(1H0,20(1H*),5X,16HDIVERSIONS (CFS),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,QOUT)
      WRITE(NWR,130)
  130 FORMAT(1H0,20(1H*),5X,19HCHANNEL FLOWS (CFS),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,Q)
      RETURN
      END
```

```
      SUBROUTINE FLOCMP
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      DIMENSION DEPTH(250),RN(250)
      DO 10 N=1,NC
      DEPTH(N)=A3(N)
      IF(A1(N).EQ.0.0.OR.Q(N).EQ.0.0)GO TO 5
      DEPTH(N)=DEPTH(N)+A1(N)*ABS(Q(N))**A2(N)
    5 A(N)=DEPTH(N)*WIDTH(N)
      IF(NVT.EQ.1.AND.RMC(N).LE.RMFR)GO TO 10
      IF(A(N).EQ.0.0)GO TO 8
      V(N)=ABS(Q(N))/A(N)
      GO TO 10
    8 WRITE(NWR,9)N
    9 FORMAT(1H1,130(1H?),/,1H ,20(1H?),21HZERO AREA IN CHANNEL ,I3,44H
     1DEPTH OR WIDTH IS ZERO - PROGRAM TERMINATES  )
      STOP
   10 CONTINUE
      VOL(1)=XLEN*A(1)
      VOL(NJ)=XLEN*A(NC)
      NL=NJ-1
```

```
      DO 20 J=2,NL
      VOL(J)=XLEN*0.5*(A(J-1)+A(J))
   20 CONTINUE
      WRITE(NWR,30)LMN(IMOB),IDAYB,IYRB,LMN(IMOE),IDAYE,IYRE
   30 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),5X,38HDEPTH OR VE
     1LOCITY DEPENDENT VARIABLES,38X,25(1H*),/,1H ,25(1H*),5X,30HBASED O
     2N FLOWS FOR THE PERIOD ,A4,1X,I2,2H, ,I4,6H THRU ,A4,1X,I2,2H, ,I4
     3,13X,25(1H*),/,1H ,130(1H*),/,1H ,130(1H*))
      WRITE(NWR,40)
   40 FORMAT(1H0,20(1H*),5X,38HCROSSECTIONAL AREAS OF CHANNELS (SQFT),
     15X,20(1H*) )
      CALL OUTGO(LVAR2,NC,RMC,A)
      WRITE(NWR,50)
   50 FORMAT(1H0,20(1H*),5X,19HCHANNEL DEPTHS (FT),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,DEPTH)
      WRITE(NWR,60)
   60 FORMAT(1H0,20(1H*),5X,27HCHANNEL VELOCITIES (FT/SEC),5X,20(1H*))
      CALL OUTGO(LVAR2,NC,RMC,V)
      WRITE(NWR,70)
   70 FORMAT(1H0,20(1H*),5X,23HJUNCTION VOLUMES (CUFT),5X,20(1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,VOL)
      IF(K2FL.NE.1) GO TO 140
      DO 80 N=1,NC
      RN(N)= (12.9*(V(N)**0.5))/(DEPTH(N)**1.5)
   80 CONTINUE
      REAIR(NJ)=RN(NC)
      REAIR(1)=RN(1)
      DO 90 J=2,NL
      REAIR(J)=0.5*(RN(J)+RN(J-1))
   90 CONTINUE
      DO 100  J=1,NJ
      XT=TEMP(J)-20.0
      XF=1.024**XT
      REAIR(J)=REAIR(J)*XF
  100 CONTINUE
```

```
      WRITE(NWR,120)
  120 FORMAT(1H0,20(1H*),5X,33HCOMPUTED REAERATION RATES (1/DAY),5X,20(1
     1H*))
      CALL OUTGO(LVAR1,NJ,RMJ,REAIR)
      DO 130 J=1,NJ
      REAIR(J)=REAIR(J)/86400.0
  130 CONTINUE
  140 VT=86400.0
      DO 150 N=1,NC
      VL=ABS(XLEN/V(N))
      IF(VL.LE.VT)VT=VL
  150 CONTINUE
      DT=VT/3600.0
      IF(DT.EQ.24.0)DT=24.0
      IF(DT.GE.12.0.AND.DT.LT.24.0)DT=12.0
      IF(DT.GE.8.0.AND.DT.LT.12.0)DT=8.0
      IF(DT.GE.6.0.AND.DT.LT.8.0)DT=6.0
      IF(DT.GE.4.0.AND.DT.LT.6.0)DT=4.0
      IF(DT.GE.3.0.AND.DT.LT.4.0)DT=3.0
      IF(DT.GE.2.0.AND.DT.LT.3.0)DT=2.0
      IF(DT.GE.1.5.AND.DT.LT.2.0)DT=1.5
      IF(DT.GE.1.0.AND.DT.LT.1.5)DT=1.0
      IF(DT.GE.0.75.AND.DT.LT.1.0)DT=0.75
      IF(DT.GE.0.50.AND.DT.LT.0.75)DT=0.50
      IF(DT.GE.0.25.AND.DT.LT.0.50)DT=0.25
      IF(DT.GE.0.125.AND.DT.LT.0.25)DT=0.125
      IF(DT.GE.0.0675.AND.DT.LT.0.125)DT=0.0675
      IF(DT.LT.0.0675)DT=0.0675
      DELTD=DT
      RETURN
      END
```

```
      SUBROUTINE VAULIN
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      NOJFX=0
      DO 10 J=1,NJ
      NFS(J)=0
      CIN(J)=0.0
   10 CONTINUE
      READ(NRD,20)IMOB,IDAYB,IYRB,IMOE,IDAYE,IYRE,NPRT,T
      IF(NPRT.EQ.0)NPRT=1
   20 FORMAT(I2,1X,I2,1X,I4,5X,I2,1X,I2,1X,I4,5X,I5,5X,F10.0)
      IF(T.NE.0.0)DELTD=T
      IF(DELTD.GT.24.0)DELTD=24.0
      NQCYC=(24.0/DELTD)+0.5
      DELT=DELTD*3600.0
      DELT2=DELT/2.0
      IYB=IYRB-1900
      IYE=IYRE-1900
      CALL SERIAL(IDAYE,IMOE,IYE,NEND)
      CALL SERIAL(IDAYB,IMOB,IYB,NBEG)
      NDAYS=NEND-NBEG+1
```

```
1000 READ(NRD,30)LABEL,DIST,QN,CN,CST
  30 FORMAT(A4,6X,4F10.0)
     IF(LABEL.EQ.LSTOP)GO TO 40
     JUNC=JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
     CIN(JUNC)=CIN(JUNC)+QN*CN
     IF(LABEL.NE.LFIXE)GO TO 1000
     NOJFX=NOJFX+1
     NFS(NOJFX)=JUNC
     C(JUNC)=CST
     GO TO 1000
  40 DO 60 J=1,NJ
     XMASS(J)=C(J)*VOL(J)
     IF(QIN(J).EQ.0.0.AND.CIN(J).NE.0.0)GO TO 70
     IF(QIN(J).EQ.0.0.AND.CIN(J).EQ.0.0)GO TO 50
     CIN(J)=CIN(J)/QIN(J)
     GO TO 60
  50 CIN(J)=0.0
  60 CONTINUE
     GO TO 90
  70 WRITE(NWR,80)J,RMJ(J)
  80 FORMAT(1H1,130(1H?),/,1H ,130(1H?),/,1H0,10(1H?),5X,33HAN INFLOW W
    1AS READ IN AT JUNCTION ,I4,12H(RIVER MILE ,F7.2,54H) IN THE QUALIT
    2Y INPUT, BUT NOT IN THE HYDRAULIC INPUT,/,1H0,10(1H?),5X,18HPROGRA
    3M TERMINATES )
     STOP
  90 WRITE(NWR,100)LTYPE,LMN(IMOB),IDAYB,IYRB,LMN(IMOE),IDAYE,IYRE
 100 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H
    1,25(1H*),5X,A4,26H INPUT CONCENTRATIONS FOR ,A4,1X,I2,2H, ,I4,6H T
    2HRU ,A4,1X,I2,2H, ,I4,13X,25(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H ,
    3130(1H*),/,1H ,130(1H*))
     CALL OUTGO(LVAR1,NJ,RMJ,CIN)
     IF(NOJFX.EQ.0)GO TO 2000
     WRITE(NWR,110)
 110 FORMAT(1H0,25(1H*),5X,15HFIXED JUNCTIONS )
     DO 130 J=1,NOJFX
```

```
      K=NFS(J)
      WRITE(NWR,120)K,RMJ(K),C(K)
  120 FORMAT(1H ,25(1H.),5X, 9HJUNCTION ,I3,13H, RIVER MILE ,F7.2,14H, I
     1S FIXED AT ,1PE11.4,6H (PPM) )
  130 CONTINUE
 2000 WRITE(NWR,135)(LALPHA(K),K=1,20)
  135 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),20A4,25(1H*))
      WRITE(NWR,140)LTYPE,LMN(IMOB),IDAYB,IYRB,LMN(IMOE),IDAYE,IYRE,
     *              NDAYS,DELTD
  140 FORMAT(                                        1H ,130(1H*),/,1H ,25(1H*),80
     1X,25(1H*),/,1H ,25(1H*),5X,A4,31H CONCENTRATIONS FOR THE PERIOD ,
     2A4,1X,I2,2H, ,I4,6H THRU ,A4,1X,I2,2H, ,I4, 8X,25(1H*),/,1H ,25(1H
     3*),5X,32HNUMBER OF DAYS IN THIS PERIOD = ,I4,39X,25(1H*),/,1H ,25(
     41H*),5X,21HTIME STEP IN HOURS = ,F6.3,48X,25(1H*),/,1H ,25(1H*),80
     5X,25(1H*),/,1H ,130(1H*),/,1H ,130(1H*),/,1H ,130(1H*))
      RETURN
      END
```

```
      SUBROUTINE VALCMP
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      DIMENSION DS1(250),DS2(250),DECAY(250)
      INTEGER D,YA
      IF(LTYPE.NE.LCBD) GO TO 20
      DO 10 J=1,NJ
      DECAY(J)=DK1(J)
   10 CONTINUE
      GO TO 60
   20 IF(LTYPE.NE.LNBD)GO TO 40
      DO 30 J=1,NJ
      DECAY(J)=DK2(J)
   30 CONTINUE
      GO TO 60
   40 DO 50 J=1,NJ
      DECAY(J)=0.0
   50 CONTINUE
   60 KPRT=1
      DO 150 LBJ=1,NDAYS
      DO 130 LCYC=1,NQCYC
```

```
      CALL CDERIV(DECAY,DS1)
      DO 90 J=1,NJ
      IF(NOJFX.LE.0)GO TO 80
      DO 70 K=1,NOJFX
      IF(NFS(K).EQ.J)GO TO 90
   70 CONTINUE
   80 C(J)=(XMASS(J)+(DS1(J)*DELT2))/VOL(J)
      IF(C(J).LT.0.0)C(J)=0.0
   90 CONTINUE
      CALL CDERIV(DECAY,DS2)
      DO 120 J=1,NJ
      IF(NOJFX.LE.0)GO TO 110
      DO 100 K=1,NOJFX
      IF(NFS(K).EQ.J)GO TO 120
  100 CONTINUE
  110 SLPE=(DS1(J)+DS2(J))/2.0
      XMASS(J)=XMASS(J)+SLPE*DELT
      C(J)=XMASS(J)/VOL(J)
      IF(C(J).LT.0.0)C(J)=0.0
  120 CONTINUE
  130 CONTINUE
      IF(LBJ.NE.KPRT)GO TO 150
      JD=NBEG+LBJ-1
      KPRT=KPRT+NPRT
      CALL CALEN(JD,D,M,YA)
      YA=YA+1900
      WRITE(NWR,140)LTYPE,LMN(M),D,YA
  140 FORMAT(1H0,10(1H*),5X,A4,26H CONCENTRATIONS (PPM)  ON ,A4,1X,I2,2H
     1, ,I4)
      CALL OUTGO(LVAR1,NJ,RMJ,C)
  150 CONTINUE
      IF(LTYPE.NE.LCBD)GO TO 170
      DO 160 J=1,NJ
      CBOD(J)=C(J)
  160 CONTINUE
```

```
      GO TO 2000
  170 IF(LTYPE.NE.LNBD)GO TO 190
          DO 180 J=1,NJ
             XNOD(J)=C(J)
  180     CONTINUE
          GO TO 2000
  190 DO 200 J=1,NJ
          CS(J)=C(J)
  200 CONTINUE
 2000 RETURN
          END
```

```
      SUBROUTINE CDERIV(DECAY,DXDT)
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION DXDT(250),DECAY(250)
      DO 10 J=1,NJ
      DXDT(J)=-DECAY(J)*VOL(J)*C(J)-C(J)*QOUT(J)+QIN(J)*CIN(J)
   10 CONTINUE
      DO 40 N=1,NC
      NL=N
      NH=N+1
      IF(Q(N).LE.0.0)GO TO 20
      CBAR=C(NL)
      GO TO 30
   20 CBAR=C(NH)
   30 DCDX=(C(NL)-C(NH))/XLEN
      FLOWQ=CBAR*Q(N)
      DIFFQ=Z(N)*A(N)*DCDX
      DXDT(NH)=DXDT(NH)+FLOWQ+DIFFQ
      DXDT(NL)=DXDT(NL)-FLOWQ-DIFFQ
   40 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE VDOIN
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      NOJFX=0
      DO 10 J=1,NJ
      DO 5 K=1,3
      MFS(J,K)=0
    5 CONTINUE
      XNDIN(J)=0.0
      CBDIN(J)=0.0
      OXIN(J)=0.0
      NFS(J)=0
   10 CONTINUE
      READ(NRD,20)IMOB,IDAYB,IYRB,IMOE,IDAYE,IYRE,NPRT,T
      IF(NPRT.EQ.0)NPRT=1
   20 FORMAT(I2,1X,I2,1X,I4,5X,I2,1X,I2,1X,I4,5X,I5,5X,F10.0)
      IF(T.NE.0.0)DELTD=T
      IF(DELTD.GT.24.0)DELTD=24.0
      NQCYC=(24.0/DELTD)+0.5
      DELT=DELTD*3600.0
      DELT2=DELT/2.0
```

```
      IYB=IYRB-1900
      IYE=IYRE-1900
      CALL SERIAL(IDAYE,IMOE,IYE,NEND)
      CALL SERIAL(IDAYB,IMOB,IYB,NBEG)
      NDAYS=NEND-NBEG+1
 1000 READ(NRD,30)LABEL,DIST,QN,CN,XN,ON,CNS,XNS,ONS
   30 FORMAT(A4,6X,2F10.0,6F7.0)
      IF(LABEL.EQ.LSTOP)GO TO 60
      JUNC=JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      CBDIN(JUNC)=QN*CN+CBDIN(JUNC)
      XNDIN(JUNC)=QN*XN+XNDIN(JUNC)
      OXIN(JUNC)=QN*ON+OXIN(JUNC)
      IF(LABEL.NE.LFIXE)GO TO 1000
      NOJFX=NOJFX+1
      NFS(NOJFX)=JUNC
      IF(CNS.EQ.0.0)GO TO 40
      CBOD(JUNC)=CNS
      MFS(NOJFX,1)=1
   40 IF(XNS.EQ.0.0)GO TO 50
      XNOD(JUNC)=XNS
      MFS(NOJFX,2)=1
   50 IF(ONS.EQ.0.0)GO TO 1000
      OXY(JUNC)=ONS
      MFS(NOJFX,3)=1
      GO TO 1000
   60 DO 70 J=1,NJ
      XCMAS(J)=CBOD(J)*VOL(J)
      XNMAS(J)=XNOD(J)*VOL(J)
      XOMAS(J)=OXY(J)*VOL(J)
      IF(QIN(J).EQ.0.0)GO TO 65
      CBDIN(J)=CBDIN(J)/QIN(J)
      XNDIN(J)=XNDIN(J)/QIN(J)
      OXIN(J)=OXIN(J)/QIN(J)
      GO TO 70
   65 IF(CBDIN(J).NE.0.0.OR.XNDIN(J).NE.0.0.OR.OXIN(J).NE.0.0) GO TO 80
```

```
 70 CONTINUE
    GO TO 100
 80 WRITE(NWR,90)J,RMJ(J)
 90 FORMAT(1H1,130(1H?),/,1H ,10(1H?),5X,33HAN INFLOW WAS READ IN AT J
   1UNCTION ,I4,12H(RIVER MILE ,F7.2,54H) IN THE QUALITY INPUT, BUT NO
   2T IN THE HYDRAULIC INPUT,/,1H0,10(1H?),5X,18HPROGRAM TERMINATES )
    STOP
100 WRITE(NWR,110)LCBD,LNBD,LDO,LMN(IMOB),IDAYB,IYRB,LMN(IMOE),IDAYE,
   *                IYRE
110 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),80X,25(1H*),/,1H
   1,25(1H*),5X,A4,2H, ,A4,5H AND ,A4,17H INPUT CONC. FOR ,A4,1X,I2,2H
   2, ,I4,6H THRU ,A4,1X,I2,2H, ,I4,7X,25(1H*),/,1H ,25(1H*),80X,25(1H
   3*),/,1H ,130(1H*),/,1H ,130(1H*))
    WRITE(NWR,120)LCBD
120 FORMAT(1H0,25(1H*),5X,A4,27H INPUT CONCENTRATIONS (PPM) )
    CALL OUTGO(LVAR1,NJ,RMJ,CBDIN)
    WRITE(NWR,120)LNBD
    CALL OUTGO(LVAR1,NJ,RMJ,XNDIN)
    WRITE(NWR,120)LDO
    CALL OUTGO(LVAR1,NJ,RMJ,OXIN)
    IF(NOJFX.EQ.0)GO TO 195
    WRITE(NWR,130)
130 FORMAT(1H0,25(1H*),5X,15HFIXED JUNCTIONS )
    DO 190 J=1,NOJFX
    JK=NFS(J)
    IF(MFS(J,1).EQ.0)GO TO 150
    WRITE(NWR,140)JK,RMJ(JK),CBOD(JK)
140 FORMAT(1H ,25(1H.),5X, 9HJUNCTION ,I3,13H, RIVER MILE ,F7.2,18H CB
   1OD IS FIXED AT ,1PE11.4,6H (PPM))
150 IF(MFS(J,2).EQ.0)GO TO 170
    WRITE(NWR,160)JK,RMJ(JK),XNOD(JK)
160 FORMAT(1H ,25(1H.),5X,9HJUNCTION ,I3,13H, RIVER MILE ,F7.2,18H NBO
   1D IS FIXED AT ,1PE11.4,6H (PPM))
170 IF(MFS(J,3).EQ.0)GO TO 190
    WRITE(NWR,180)JK,RMJ(JK),OXY(JK)
```

```
  180 FORMAT(1H ,25(1H-),5X,9HJUNCTION ,I3,13H, RIVER MILE ,F7.2,16H DO
     1IS FIXED AT ,1PE11.4,6H (PPM))
  190 CONTINUE
  195 WRITE(NWR,194)(LALPHA(K),K=1,20)
  194 FORMAT(1H1,130(1H*),/,1H ,130(1H*),/,1H ,25(1H*),20A4,25(1H*))
      WRITE(NWR,200)LCBD,LNBD,LDO,LMN(IMOB),IDAYB,IYRB,LMN(IMOE),IDAYE,
     *          IYRE,NDAYS,DELTD
  200 FORMAT(                          1H ,130(1H*),/,1H ,25(1H*),80
     1X,25(1H*),/,1H ,25(1H*),5X,A4,2H, ,A4,5H AND ,A4,21H CONC FOR THE
     2PERIOD ,A4,1X,I2,2H, ,I4,6H THRU ,A4,1X,I2,2H, ,I4,3X,25(1H*),/,1H
     3 ,25(1H*),5X,32HNUMBER OF DAYS IN THIS PERIOD = ,I4,39X,25(1H*),/,
     41H ,25(1H*),5X,21HTIME STEP IN HOURS = ,F6.3,48X,25(1H*),/,1H ,25(
     51H*),80X,25(1H*),/,1H ,130(1H*),/,1H ,130(1H*),/,1H ,130(1H*) )
 2000 RETURN
      END
```

```
      SUBROUTINE VDOCP
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMDE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION LMN(12)
      DATA LMN(1)/4HJAN./,LMN(2)/4HFEB./,LMN(3)/4HMAR./,LMN(4)/4HAPR./,
     1     LMN(5)/4HMAY /,LMN(6)/4HJUNE/,LMN(7)/4HJULY/,LMN(8)/4HAUG./,
     2     LMN(9)/4HSEP./,LMN(10)/4HOCT./,LMN(11)/4HNOV./,
     3     LMN(12)/4HDEC./
      DIMENSION DO1(250),DC1(250),DN1(250),DO2(250),DC2(250),DN2(250)
      INTEGER D,YA
      KPRT=1
      DO 150 LBJ=1,NDAYS
      DO 125 LCYC=1,NQCYC
      CALL ODERIV(DO1,DC1,DN1)
      DO 60 J=1,NJ
      IF(NOJFX.EQ.0) GO TO 50
      DO 40 L=1,NOJFX
      JK=NFS(L)
      IF(J.NE.JK)GO TO 40
      IF(MFS(L,1).EQ.1)GO TO 10
      CBOD(J)=(XCMAS(J)+(DC1(J)*DELT2))/VOL(J)
   10 IF(MFS(L,2).EQ.1)GO TO 20
      XNOD(J)=(XNMAS(J)+(DN1(J)*DELT2))/VOL(J)
   20 IF(MFS(L,3).EQ.1)GO TO 30
      OXY(J)=(XOMAS(J)+(DO1(J)*DELT2))/VOL(J)
   30 GO TO 55
```

```
 40 CONTINUE
 50 CBOD(J)=(XCMAS(J)+(DC1(J)*DELT2))/VOL(J)
    XNOD(J)=(XNMAS(J)+(DN1(J)*DELT2))/VOL(J)
    OXY(J)=(XOMAS(J)+(DO1(J)*DELT2))/VOL(J)
 55 IF(CBOD(J).LT.0.0)CBOD(J)=0.0
    IF(XNOD(J).LT.0.0)XNOD(J)=0.0
    IF(OXY(J).LT.0.0)OXY(J)=0.0
 60 CONTINUE
    CALL ODERIV(DO2,DC2,DN2)
    DO 120 J=1,NJ
    IF(NOJFX.EQ.0)GO TO 110
    DO 100 L=1,NOJFX
    JK=NFS(L)
    IF(J.NE.JK)GO TO 100
    IF(MFS(L,1).EQ.1)GO TO 70
    S=(DC1(J)+DC2(J))/2.0
    XCMAS(J)=XCMAS(J)+S*DELT
    CBOD(J)=XCMAS(J)/VOL(J)
 70 IF(MFS(L,2).EQ.1)GO TO 80
    S=(DN1(J)+DN2(J))/2.0
    XNMAS(J)=XNMAS(J)+S*DELT
    XNOD(J)=XNMAS(J)/VOL(J)
 80 IF(MFS(L,3).EQ.1)GO TO 90
    S=(DO1(J)+DO2(J))/2.0
    XOMAS(J)=XOMAS(J)+S*DELT
    OXY(J)=XOMAS(J)/VOL(J)
 90 GO TO 115
100 CONTINUE
110 S=(DC1(J)+DC2(J))/2.0
    XCMAS(J)=XCMAS(J)+S*DELT
    CBOD(J)=XCMAS(J)/VOL(J)
    S=(DN1(J)+DN2(J))/2.0
    XNMAS(J)=XNMAS(J)+S*DELT
    XNOD(J)=XNMAS(J)/VOL(J)
    S=(DO1(J)+DO2(J))/2.0
```

```
      XOMAS(J)=XOMAS(J)+S*DELT
      OXY(J)=XOMAS(J)/VOL(J)
  115 IF(CBOD(J).LT.0.0)CBOD(J)=0.0
      IF(XNOD(J).LT.0.0)XNOD(J)=0.0
      IF(OXY(J).LT.0.0)OXY(J)=0.0
  120 CONTINUE
  125 CONTINUE
      IF(LBJ.NE.KPRT)GO TO 150
      JD=NBEG+LBJ-1
      KPRT=KPRT+NPRT
      CALL CALEN(JD,D,M,YA)
      YA=YA+1900
      WRITE(NWR,130)LCBD,LNBD,LDO,LMN(M),D,YA
  130 FORMAT(1H0,10(1H*),5X,A4,2H, ,A4,5H AND ,A4,19H CONCENTRATIONS ON
     1,A4,1X,I2,2H, ,I4 )
      WRITE(NWR,140)LCBD
  140 FORMAT(1H0,10(1H.),5X,A4,21H CONCENTRATIONS (PPM) )
      CALL OUTGO(LVAR1,NJ,RMJ,CBOD)
      WRITE(NWR,140)LNBD
      CALL OUTGO(LVAR1,NJ,RMJ,XNOD)
      WRITE(NWR,140)LDO
      CALL OUTGO(LVAR1,NJ,RMJ,OXY)
  150 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE ODERIV(DODT,DCDT,DNDT)
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION DODT(250),DCDT(250),DNDT(250)
      DO 10 J=1,NJ
      DKC=DK1(J)
      IF(OXY(J).LE.0.0)DKC=0.0
      DKN=DK2(J)
      CO=0.05*DOS(J)
      IF(OXY(J).LE.CO)DKN=0.0
      DCDT(J)=-DKC*VOL(J)*CBOD(J)-CBOD(J)*QOUT(J)+QIN(J)*CBDIN(J)
      DNDT(J)=-DKN*VOL(J)*XNOD(J)-XNOD(J)*QOUT(J)+QIN(J)*XNDIN(J)
      DODT(J)=OXIN(J)*QIN(J)-OXY(J)*QOUT(J)+REAIR(J)*VOL(J)*(DOS(J)-OXY(
     1J))-(DKN*XNOD(J)+DKC*CBOD(J))*VOL(J)+(PHOTO(J)-SEDMT(J)-EVAP(J)*OX
     2Y(J))*AS(J)
   10 CONTINUE
      DO 40 N=1,NC
      NL=N
      NH=N+1
      IF(Q(N).LE.0.0)GO TO 20
      OBAR=OXY(NL)
      CBAR=CBOD(NL)
      XBAR=XNOD(NL)
      GO TO 30
   20 OBAR=OXY(NH)
      CBAR=CBOD(NH)
```

```
      XBAR=XNOD(NH)
   30 DODX=(OXY(NL)-OXY(NH))/XLEN
      DCDX=(CBOD(NL)-CBOD(NH))/XLEN
      DNDX=(XNOD(NL)-XNOD(NH))/XLEN
         FLQO=QBAR*Q(N)
         FLQC=CBAR*Q(N)
         FLQN=XBAR*Q(N)
         DFQO=Z(N)*A(N)*DODX
         DFQC=Z(N)*A(N)*DCDX
         DFQN=Z(N)*A(N)*DNDX
         DODT(NH)=DODT(NH)+FLQO+DFQO
         DCDT(NH)=DCDT(NH)+FLQC+DFQC
         DNDT(NH)=DNDT(NH)+FLQN+DFQN
         DODT(NL)=DODT(NL)-FLQO-DFQO
         DCDT(NL)=DCDT(NL)-FLQC-DFQC
         DNDT(NL)=DNDT(NL)-FLQN-DFQN
   40 CONTINUE
      RETURN
      END
```

```
      FUNCTION JKFND(NJ,XMIL,DIST,RMUP,RMDWN)
      NSET=1+IFIX(((DIST-RMDWN)/XMIL)+0.5)
      IF(DIST.LT.RMDWN) NSET=1
      IF(DIST.GT.RMUP) NSET=NJ
      JKFND=NSET
      RETURN
      END
```

```
      SUBROUTINE SERIAL(D,M,YA,K)
      INTEGER D,M,K,N,YA,XA
      IF(M.GT.2) GO TO 10
         N=M+9
         XA=YA-1
         GO TO 20
   10 N=M-3
      XA=YA
   20 K=(1461*XA)/4+(153*N+2)/5+D
      RETURN
      END
```

```
      SUBROUTINE TABU(X,Y,XPT,NPTS,YPT)
      DIMENSION X(NPTS),Y(NPTS)
      IF(NPTS.EQ.1) GO TO 10
      NPM1=NPTS-1
      IF(XPT.LE.X(1)) GO TO 10
      IF(XPT.GE.X(NPTS)) GO TO 20
      DO 30 J=1,NPM1
      IF(XPT.GE.X(J).AND.XPT.LE.X(J+1)) GO TO 40
   30 CONTINUE
   40 S=(XPT-X(J))/(X(J+1)-X(J))
      YPT=Y(J)+(Y(J+1)-Y(J))*S
      GO TO 50
   20 YPT=Y(NPTS)
      GO TO 50
   10 YPT=Y(1)
   50 RETURN
      END
```

```
      SUBROUTINE INTER (REVAL,NMAT,X,Y,NPTS,RM)
      DIMENSION REVAL(NMAT),X(NPTS),Y(NPTS),RM(NMAT)
      DO 21  I=1,NPTS
      TEST=X(I)
      JTMP=I
      DO 22 J=I,NPTS
      IF(X(J).GE.TEST) GO TO 22
      TEST=X(J)
      JTMP=J
   22 CONTINUE
      XTMP=X(I)
      YTMP=Y(I)
      X(I)=X(JTMP)
      Y(I)=Y(JTMP)
      X(JTMP)=XTMP
      Y(JTMP)=YTMP
   21 CONTINUE
      DO 10  J=1,NMAT
      XPT=RM(J)
      CALL TABU  (X,Y,XPT,NPTS,YPT)
      REVAL(J)=YPT
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CALEN (K,D,M,YA)
      INTEGER K,D,M,YA
      YA=(4*K-1)/1461
      D= 4*K-1-1461*YA
      D=(D+4)/4
      M= (5*D-3)/153
      D= 5*D-3-153*M
      D=(D+5)/5
      IF(M.LT.10) GO TO 20
      M=M-9
      YA=YA+1
      GO TO 30
   20 M=M+3
   30 RETURN
      END
```

```
      SUBROUTINE OUTGO(LVAR,NP,X,Y)
      COMMON QIN(250),QOUT(250),Q(250),A(250),Z(250),XNDIN(250),
     1       CBDIN(250),OXIN(250),CIN(250),C(250),REAIR(250),VOL(250),
     2       PHOTO(250),EVAP(250),AS(250),SEDMT(250),DOS(250),V(250),
     3       WIDTH(250),A1(250),A2(250),A3(250),TEMP(250),DK1(250),
     4       DK2(250),CBOD(250),XNOD(250),OXY(250),CS(250),NFS(250),
     5       XMASS(250),XNMAS(250),XCMAS(250),XOMAS(250),MFS(250,3),
     6       RMJ(250),RMC(250),LALPHA(20)
      COMMON NJ,NC,XLEN,NOJFX,RMUP,RMDWN,RMFR,DELT,DELT2,DELTD,NPRT,
     1       NQCYC,NSECS,XMIL,NBEG,NEND,IMOB,IDAYB,IYRB,IMOE,IDAYE,
     2       IYRE,NDAYS,K2FL,LTYPE,LCBD,LNBD,LDO,LSTOP,LVAR1,LVAR2,
     3       LFIXE,NRD,NWR,NVT
      DIMENSION X(250),Y(250)
C
C
      ILINE= NP/4
      IEXTA= NP-4*ILINE
      WRITE(NWR,10)LVAR,LVAR,LVAR,LVAR
   10 FORMAT(1H0,3X,A4,4X,5HRIVER,18X,A4,4X,5HRIVER,18X,A4,4X,5HRIVER,18
     1X,A4,4X,5HRIVER,/,1H ,4X,2HNO,5X,4HMILE,7X,5HVALUE,8X,2HNO,5X,4HMI
     2LE,7X,5HVALUE,8X,2HNO,5X,4HMILE,7X,5HVALUE,8X,2HNO,5X,4HMILE,7X,5H
     3VALUE )
      DO 30 I=1,ILINE
      I2=I+ILINE+IEXTA
      I3=I2+ILINE
      I4=I3+ILINE
      WRITE(NWR,20)I,X(I),Y(I),I2,X(I2),Y(I2),I3,X(I3),Y(I3),I4,X(I4),
     1             Y(I4)
   20 FORMAT(1H ,3X,I3,4X,F6.2,4X,1PE10.3,4X,I3,4X,0PF6.2,4X,1PE10.3,
     14X,I3,4X,0PF6.2,4X,1PE10.3,4X,I3,4X,0PF6.2,4X,1PE10.3)
   30 CONTINUE
      IF(IEXTA.EQ.0)GO TO 60
      IEND=ILINE+IEXTA
      IBEG=ILINE+1
      DO 50 I=IBEG,IEND
```

```
      WRITE(NWR,40)I,X(I),Y(I)
   40 FORMAT(1H ,3X,I3,4X,F6.2,4X,1PE10.3)
   50 CONTINUE
   60 RETURN
      END
```

AUTØQD EXAMPLE PROBLEM

The stream/estuary system used in the AUTØSS example is used for this example. The input data is the same except for the flow at mile 100.0 (River Flow) and the TDS (Total Dissolved Solids) boundary condition at mile 0.0.

PROBLEM STATEMENT

Using the steady state values obtained in the AUTØSS example problem (5000 cfs at mile 100.0), as initial values, run the same constituents (TDS, CBØD, NBØD, DØ) for a continuous 20 day period (January 1-20, 1973) using the following inflows and downstream TDS boundary conditions:

Jan. 1- 5	Flow @ mile	100.0	=	6000 cfs
	TDS @ mile	0.0	=	18000 ppm
Jan. 6-10	Flow @ mile	100.0	=	8000 cfs
	TDS @ mile	0.0	=	15000 ppm
Jan. 11-15	Flow @ mile	100.0	=	6000 cfs
	TDS @ mile	0.0	=	18000 ppm
Jan. 16-20	Flow @ mile	100.0	=	5000 cfs
	TDS @ mile	0.0	=	20000 ppm

CBØD, NBØD and DØ inflow concentrations will remain the same for the entire period. Have the program compute its own time step and print out qualities every day.

The data deck for this example is as follows:

```
                AUTØQD - TEST PRØBLEM
        0.0          100.0          50.0                  49
DATA
WIDTH                2
     1                  0.0       10000.0
     2                 50.0        5000.0
DISP                 3
     1                  0.0        5000.0
     2                 50.0         100.0
     3                100.0          50.0
VELØ                 1
     1                  0.0           1.5
TEMP                 1
     1                  0.0          25.0
PHØTØ                3
     1                  0.0           1.5
     2                 50.0           0.5
     3                100.0           0.0
SEDI                 4
     1                  0.0           1.0
     2                 50.0           0.5
     3                 75.0           1.0
     4                 80.0           0.0
```

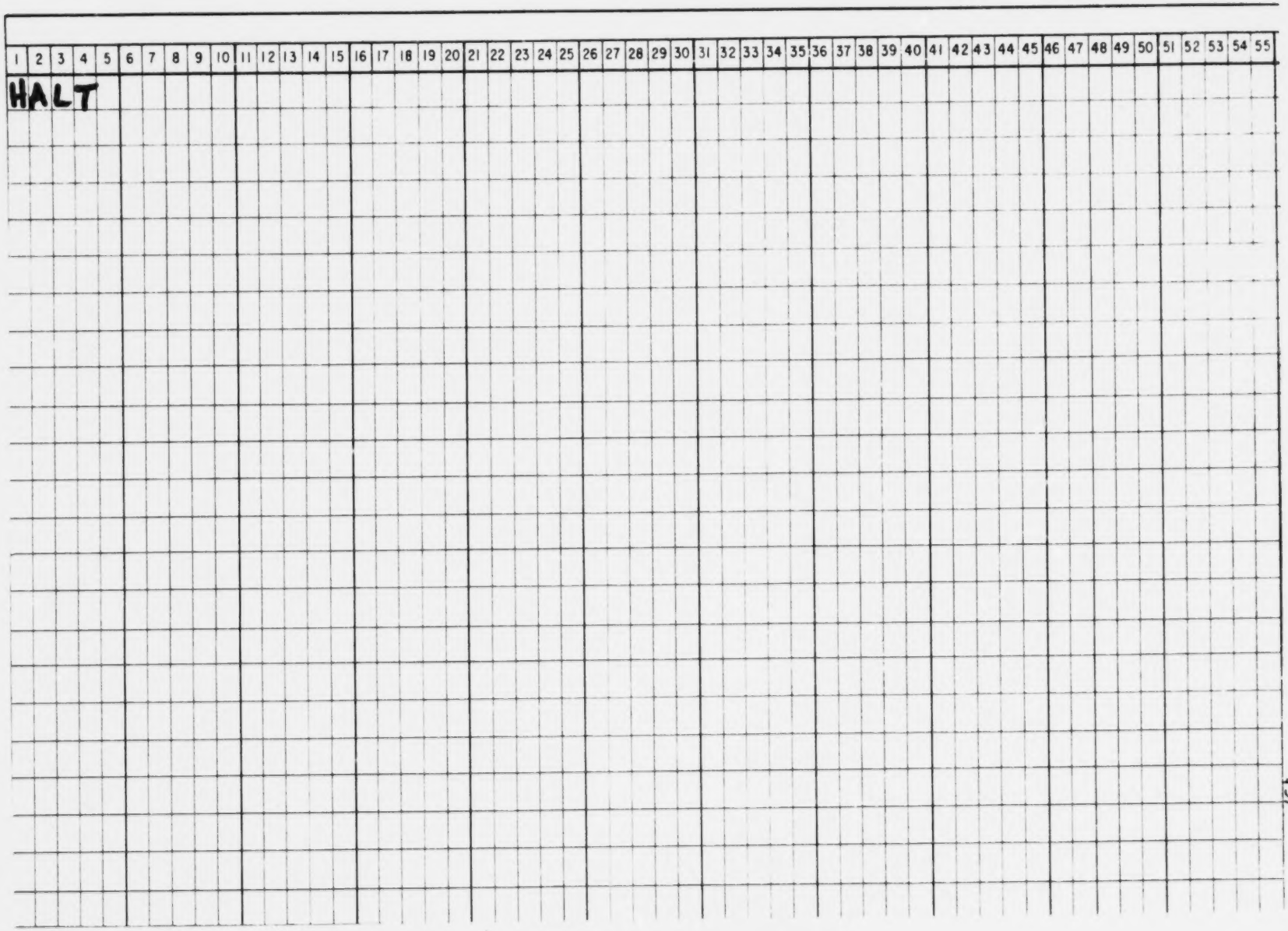
```
CDECAY        1
    1            0.0      0.23
NDECAY        1
    1            0.0      0.15
A1            3
    1          100.0      0.02
    2           51.0      0.05
    3           50.0       0.0
A2            3
    1          100.0       0.6
    2           51.0       0.6
    3           50.0       0.0
A3            2
    1           51.0       0.0
    2           50.0      15.0
C-SATDØ
C-REAER
INITTDS       9
    1            0.0   20000.0
    2           10.2   12810.0
    3           16.3    9030.0
    4           22.5    5802.0
    5           30.6    2561.0
```

6		36.7	1031.0
7		40.8	434.0
8		46.9	50.0
9		53.1	0.0
INITCBØD	10		
1		100.0	5.3
2		91.8	3.2
3		85.7	2.0
4		77.6	1.0
5		75.5	2.3
6		69.4	1.3
7		61.2	0.5
8		53.1	0.2
9		50.0	0.1
10		0.0	0.0
INITNBØD	10		
1		100.0	5.6
2		93.9	4.5
3		87.8	3.5
4		79.6	2.4
5		77.6	2.2
6		75.5	3.4
7		67.4	2.1

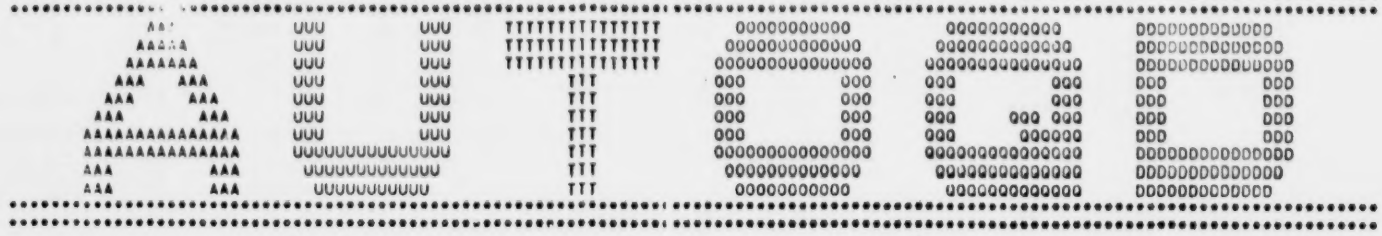
```
        8                57.1                1.1
        9                50.0                0.5
       10                 0.0                0.0
INITD0                    8
        1               100.0                6.1
        2                89.8                6.4
        3                77.6                6.7
        4                75.5                5.9
        5                69.4                5.4
        6                59.2                5.8
        7                46.9                7.5
        8                30.6                8.3
ST0P
FL0W
01-01-1973               01-05-1973
                        100.0          6000.0
                         75.0           500.0
ST0P
TDS
01-01-1973               01-05-1973                1
FIXED                     0.0                                  18000.0
ST0P
D0
```

```
01-01-1973          01-05-1973                  1
                    100.0        6000.0         6.0        6.0        6.0
                     75.0         500.0        20.0       20.0        2.0
STØP
FLØW
01-06-1973          01-10-1973
                    100.0        8000.0
                     75.0         500.0
STØP
TDS
01-06-1973          01-10-1973                  1
FIXED                  0.0                                      15000.0
STØP
DØ
01-06-1973          01-10-1973                  1
                    100.0        8000.0         6.0        6.0        6.0
                     75.0         500.0        20.0       20.0        2.0
STØP
FLØW
01-11-1973          01-15-1973
                    100.0        6000.0
                     75.0         500.0
STØP
```

```
TDS
01-11-1973          01-15-1973                  1
FIXED                  0.0                                        18000.0
STØP
DØ
01-11-1973          01-15-1973                  1
                    100.0        6000.0         6.0        6.0        6.0
                     75.0         500.0        20.0       20.0        2.0
STØP
FLØW
01-16-1973          01-20-1973
                    100.0        5000.0
                     75.0         500.0
STØP
TDS
01-16-1973          01-20-1973                  1
FIXED                  0.0                                        20000.0
STØP
DØ
01-16-1973          01-20-1973                  1
                    100.0        5000.0         6.0        6.0        6.0
                     75.0         500.0        20.0       20.0        2.0
STØP
```


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
HALT

The output for this example is as follows:



QUASI-DYNAMIC WATER QUALITY MODEL

RUN TITLE..... AUTOQD - TEST PROBLEM

BASIC NETWORK DATA

RIVER MILE AT DOWNSTREAM END...	1.0
RIVER MILE AT UPSTREAM END.....	100.00
RIVER MILE OF FALL LINE.....	50.00
NUMBER OF SECTIONS.....	49

ESTUARY/STREAM INPUT DATA

CHANNEL WIDTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	9.898E+03	14	27.55	7.245E+03	26	52.04	5.000E+03	38	76.53	5.000E+03
2	3.06	9.694E+03	15	29.59	7.041E+03	27	54.08	5.000E+03	39	78.57	5.000E+03
3	5.10	9.490E+03	16	31.63	6.837E+03	28	56.12	5.000E+03	40	80.61	5.000E+03
4	7.14	9.286E+03	17	33.67	6.633E+03	29	58.16	5.000E+03	41	82.65	5.000E+03
5	9.18	9.082E+03	18	35.71	6.429E+03	30	60.20	5.000E+03	42	84.69	5.000E+03
6	11.22	8.878E+03	19	37.75	6.225E+03	31	62.24	5.000E+03	43	86.73	5.000E+03
7	13.27	8.673E+03	20	39.80	6.020E+03	32	64.29	5.000E+03	44	88.77	5.000E+03
8	15.31	8.469E+03	21	41.84	5.816E+03	33	66.33	5.000E+03	45	90.82	5.000E+03
9	17.35	8.265E+03	22	43.88	5.612E+03	34	68.37	5.000E+03	46	92.86	5.000E+03
10	19.39	8.061E+03	23	45.92	5.408E+03	35	70.41	5.000E+03	47	94.90	5.000E+03
11	21.43	7.857E+03	24	47.96	5.204E+03	36	72.45	5.000E+03	48	96.94	5.000E+03
12	23.47	7.653E+03	25	50.00	5.000E+03	37	74.49	5.000E+03	49	98.98	5.000E+03
13	25.51	7.449E+03									

JUNCTION SURFACE AREAS (SQFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.068E+08	15	28.57	7.704E+07	27	53.06	5.393E+07	39	77.55	5.393E+07
2	2.04	1.057E+08	16	30.61	7.484E+07	28	55.10	5.393E+07	40	79.59	5.393E+07
3	4.08	1.035E+08	17	32.65	7.264E+07	29	57.14	5.393E+07	41	81.63	5.393E+07
4	6.12	1.013E+08	18	34.69	7.044E+07	30	59.18	5.393E+07	42	83.67	5.393E+07
5	8.16	9.905E+07	19	36.73	6.824E+07	31	61.22	5.393E+07	43	85.71	5.393E+07
6	10.20	9.685E+07	20	38.78	6.604E+07	32	63.26	5.393E+07	44	87.75	5.393E+07
7	12.24	9.465E+07	21	40.82	6.383E+07	33	65.31	5.393E+07	45	89.80	5.393E+07
8	14.29	9.245E+07	22	42.86	6.163E+07	34	67.35	5.393E+07	46	91.84	5.393E+07
9	16.33	9.025E+07	23	44.90	5.943E+07	35	69.39	5.393E+07	47	93.88	5.393E+07
10	18.37	8.805E+07	24	46.94	5.723E+07	36	71.43	5.393E+07	48	95.92	5.393E+07
11	20.41	8.585E+07	25	48.98	5.503E+07	37	73.47	5.393E+07	49	97.96	5.393E+07
12	22.45	8.364E+07	26	51.02	5.393E+07	38	75.51	5.393E+07	50	100.00	0.0
13	24.49	8.144E+07									
14	26.53	7.924E+07									

DISPERSION COEFFICIENTS (SQFT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	4.900E+03	14	27.55	2.300E+03	26	52.04	9.796E+01	38	76.53	7.347E+01
2	3.06	4.700E+03	15	29.59	2.100E+03	27	54.08	9.592E+01	39	78.57	7.143E+01
3	5.10	4.500E+03	16	31.63	1.900E+03	28	56.12	9.388E+01	40	80.61	6.939E+01
4	7.14	4.300E+03	17	33.67	1.700E+03	29	58.16	9.184E+01	41	82.65	6.735E+01
5	9.18	4.100E+03	18	35.71	1.500E+03	30	60.20	8.980E+01	42	84.69	6.531E+01
6	11.22	3.900E+03	19	37.75	1.300E+03	31	62.24	8.776E+01	43	86.73	6.327E+01
7	13.27	3.700E+03	20	39.80	1.100E+03	32	64.29	8.571E+01	44	88.77	6.123E+01
8	15.31	3.500E+03	21	41.84	9.000E+02	33	66.33	8.367E+01	45	90.82	5.918E+01
9	17.35	3.300E+03	22	43.88	7.000E+02	34	68.37	8.163E+01	46	92.86	5.714E+01
10	19.39	3.100E+03	23	45.92	5.000E+02	35	70.41	7.959E+01	47	94.90	5.510E+01
11	21.43	2.900E+03	24	47.96	3.000E+02	36	72.45	7.755E+01	48	96.94	5.306E+01
12	23.47	2.700E+03	25	50.00	1.000E+02	37	74.49	7.551E+01	49	98.98	5.102E+01

13 25.51 2.500E+03

********** AVERAGE CHANNEL TIDAL VELOCITIES (FT/SEC) **********

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	0.0	38	76.53	0.0
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	0.0	39	78.57	0.0
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	0.0	40	80.61	0.0
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	0.0	41	82.65	0.0
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	0.0	42	84.69	0.0
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	0.0	43	86.73	0.0
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	0.0	44	88.77	0.0
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	0.0	45	90.82	0.0
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	0.0	46	92.86	0.0
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	0.0	47	94.90	0.0
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	0.0	48	96.94	0.0
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	0.0	49	98.98	0.0
13	25.51	1.500E+00									

********** JUNCTION WATER TEMPERATURES (DEG-C) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.500E+01	15	28.57	2.500E+01	27	53.06	2.500E+01	39	77.55	2.500E+01
2	2.04	2.500E+01	16	30.61	2.500E+01	28	55.10	2.500E+01	40	79.59	2.500E+01
3	4.08	2.500E+01	17	32.65	2.500E+01	29	57.14	2.500E+01	41	81.63	2.500E+01
4	6.12	2.500E+01	18	34.69	2.500E+01	30	59.18	2.500E+01	42	83.67	2.500E+01
5	8.16	2.500E+01	19	36.73	2.500E+01	31	61.22	2.500E+01	43	85.71	2.500E+01
6	10.20	2.500E+01	20	38.78	2.500E+01	32	63.26	2.500E+01	44	87.75	2.500E+01
7	12.24	2.500E+01	21	40.82	2.500E+01	33	65.31	2.500E+01	45	89.80	2.500E+01
8	14.29	2.500E+01	22	42.86	2.500E+01	34	67.35	2.500E+01	46	91.84	2.500E+01
9	16.33	2.500E+01	23	44.90	2.500E+01	35	69.39	2.500E+01	47	93.88	2.500E+01
10	18.37	2.500E+01	24	46.94	2.500E+01	36	71.43	2.500E+01	48	95.92	2.500E+01
11	20.41	2.500E+01	25	48.98	2.500E+01	37	73.47	2.500E+01	49	97.96	2.500E+01
12	22.45	2.500E+01	26	51.02	2.500E+01	38	75.51	2.500E+01	50	100.00	2.500E+01
13	24.49	2.500E+01									
14	26.53	2.500E+01									

********** AVERAGE DAILY PHOTOSYNTHESIS-RESPIRATION RATE (GM O2/SQM/DAY) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+00	15	28.57	9.286E-01	27	53.06	4.694E-01	39	77.55	2.245E-01
2	2.04	1.459E+00	16	30.61	8.878E-01	28	55.10	4.490E-01	40	79.59	2.041E-01
3	4.08	1.418E+00	17	32.65	8.469E-01	29	57.14	4.286E-01	41	81.63	1.837E-01
4	6.12	1.378E+00	18	34.69	8.061E-01	30	59.18	4.082E-01	42	83.67	1.633E-01
5	8.16	1.337E+00	19	36.73	7.653E-01	31	61.22	3.878E-01	43	85.71	1.429E-01
6	10.20	1.296E+00	20	38.78	7.245E-01	32	63.26	3.674E-01	44	87.75	1.225E-01
7	12.24	1.255E+00	21	40.82	6.837E-01	33	65.31	3.469E-01	45	89.80	1.020E-01
8	14.29	1.214E+00	22	42.86	6.429E-01	34	67.35	3.265E-01	46	91.84	8.164E-02
9	16.33	1.173E+00	23	44.90	6.020E-01	35	69.39	3.061E-01	47	93.88	6.123E-02
10	18.37	1.133E+00	24	46.94	5.612E-01	36	71.43	2.857E-01	48	95.92	4.082E-02
11	20.41	1.092E+00	25	48.98	5.204E-01	37	73.47	2.653E-01	49	97.96	2.041E-02
12	22.45	1.051E+00	26	51.02	4.898E-01	38	75.51	2.449E-01	50	100.00	5.960E-06
13	24.49	1.010E+00									
14	26.53	9.694E-01									

********** OXYGEN UPTAKE OF SEDIMENTS (GM O2/SQM/DAY) **********

JUNC	RIVER	JUNC	RIVER	JUNC	RIVER	JUNC	RIVER

NO	MILE	VALUE	NO	MILE	VALUE	NO	MILE	VALUE	NO	MILE	VALUE
1	0.0	1.000E+00	15	28.57	7.143E-01	27	53.06	5.612E-01	39	77.55	4.899E-01
2	2.04	9.796E-01	16	30.61	6.939E-01	28	55.10	6.020E-01	40	79.59	8.172E-02
3	4.08	9.592E-01	17	32.65	6.735E-01	29	57.14	6.429E-01	41	81.63	0.0
4	6.12	9.388E-01	18	34.69	6.531E-01	30	59.18	6.837E-01	42	83.67	0.0
5	8.16	9.184E-01	19	36.73	6.327E-01	31	61.22	7.245E-01	43	85.71	0.0
6	10.20	8.980E-01	20	38.78	6.122E-01	32	63.26	7.653E-01	44	87.75	0.0
7	12.24	8.776E-01	21	40.82	5.918E-01	33	65.31	8.061E-01	45	89.80	0.0
8	14.29	8.571E-01	22	42.86	5.714E-01	34	67.35	8.469E-01	46	91.84	0.0
9	16.33	8.367E-01	23	44.90	5.510E-01	35	69.39	8.877E-01	47	93.88	0.0
10	18.37	8.163E-01	24	46.94	5.306E-01	36	71.43	9.286E-01	48	95.92	0.0
11	20.41	7.959E-01	25	48.98	5.102E-01	37	73.47	9.694E-01	49	97.96	0.0
12	22.45	7.755E-01	26	51.02	5.204E-01	38	75.51	8.980E-01	50	100.00	0.0
13	24.49	7.551E-01									
14	26.53	7.347E-01									

•••••••••••••••••••• CBOD DECAY RATES CORRECTED TO STREAM TEMPS - (1/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.894E-01	15	28.57	2.894E-01	27	53.06	2.894E-01	39	77.55	2.894E-01
2	2.04	2.894E-01	16	30.61	2.894E-01	28	55.10	2.894E-01	40	79.59	2.894E-01
3	4.08	2.894E-01	17	32.65	2.894E-01	29	57.14	2.894E-01	41	81.63	2.894E-01
4	6.12	2.894E-01	18	34.69	2.894E-01	30	59.18	2.894E-01	42	83.67	2.894E-01
5	8.16	2.894E-01	19	36.73	2.894E-01	31	61.22	2.894E-01	43	85.71	2.894E-01
6	10.20	2.894E-01	20	38.78	2.894E-01	32	63.26	2.894E-01	44	87.75	2.894E-01
7	12.24	2.894E-01	21	40.82	2.894E-01	33	65.31	2.894E-01	45	89.80	2.894E-01
8	14.29	2.894E-01	22	42.86	2.894E-01	34	67.35	2.894E-01	46	91.84	2.894E-01
9	16.33	2.894E-01	23	44.90	2.894E-01	35	69.39	2.894E-01	47	93.88	2.894E-01
10	18.37	2.894E-01	24	46.94	2.894E-01	36	71.43	2.894E-01	48	95.92	2.894E-01
11	20.41	2.894E-01	25	48.98	2.894E-01	37	73.47	2.894E-01	49	97.96	2.894E-01
12	22.45	2.894E-01	26	51.02	2.894E-01	38	75.51	2.894E-01	50	100.00	2.894E-01
13	24.49	2.894E-01									
14	26.53	2.894E-01									

•••••••••••••••••••• NBOD DECAY RATES CORRECTED TO STREAM TEMPS - (1/DAY) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.616E-01	15	28.57	1.616E-01	27	53.06	1.616E-01	39	77.55	1.616E-01
2	2.04	1.616E-01	16	30.61	1.616E-01	28	55.10	1.616E-01	40	79.59	1.616E-01
3	4.08	1.616E-01	17	32.65	1.616E-01	29	57.14	1.616E-01	41	81.63	1.616E-01
4	6.12	1.616E-01	18	34.69	1.616E-01	30	59.18	1.616E-01	42	83.67	1.616E-01
5	8.16	1.616E-01	19	36.73	1.616E-01	31	61.22	1.616E-01	43	85.71	1.616E-01
6	10.20	1.616E-01	20	38.78	1.616E-01	32	63.26	1.616E-01	44	87.75	1.616E-01
7	12.24	1.616E-01	21	40.82	1.616E-01	33	65.31	1.616E-01	45	89.80	1.616E-01
8	14.29	1.616E-01	22	42.86	1.616E-01	34	67.35	1.616E-01	46	91.84	1.616E-01
9	16.33	1.616E-01	23	44.90	1.616E-01	35	69.39	1.616E-01	47	93.88	1.616E-01
10	18.37	1.616E-01	24	46.94	1.616E-01	36	71.43	1.616E-01	48	95.92	1.616E-01
11	20.41	1.616E-01	25	48.98	1.616E-01	37	73.47	1.616E-01	49	97.96	1.616E-01
12	22.45	1.616E-01	26	51.02	1.616E-01	38	75.51	1.616E-01	50	100.00	1.616E-01
13	24.49	1.616E-01									
14	26.53	1.616E-01									

•••••••••••••••••••• A1 COEFFICIENT FOR FLOW EQUATION ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	0.0	14	27.55	0.0	26	52.04	4.936E-02	38	76.53	3.437E-02
2	3.06	0.0	15	29.59	0.0	27	54.08	4.811E-02	39	78.57	3.312E-02
3	5.10	0.0	16	31.63	0.0	28	56.12	4.686E-02	40	80.61	3.187E-02

4	7.14	0.0	17	33.67	0.0	29	58.16	4.561E-02	41	82.65	3.062E-02
5	9.18	0.0	18	35.71	0.0	30	60.20	4.437E-02	42	84.69	2.937E-02
6	11.22	0.0	19	37.75	0.0	31	62.24	4.312E-02	43	86.73	2.812E-02
7	13.27	0.0	20	39.80	0.0	32	64.29	4.187E-02	44	88.77	2.687E-02
8	15.31	0.0	21	41.84	0.0	33	66.33	4.062E-02	45	90.82	2.562E-02
9	17.35	0.0	22	43.88	0.0	34	68.37	3.937E-02	46	92.86	2.437E-02
10	19.39	0.0	23	45.92	0.0	35	70.41	3.812E-02	47	94.90	2.312E-02
11	21.43	0.0	24	47.96	0.0	36	72.45	3.687E-02	48	96.94	2.187E-02
12	23.47	0.0	25	50.00	0.0	37	74.49	3.562E-02	49	98.98	2.063E-02
13	25.51	0.0									

•••••••••••••••••••• A2 COEFFICIENT FOR FLOW EQUATION ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	0.0	14	27.55	0.0	26	52.04	6.000E-01	38	76.53	6.000E-01
2	3.06	0.0	15	29.59	0.0	27	54.08	6.000E-01	39	78.57	6.000E-01
3	5.10	0.0	16	31.63	0.0	28	56.12	6.000E-01	40	80.61	6.000E-01
4	7.14	0.0	17	33.67	0.0	29	58.16	6.000E-01	41	82.65	6.000E-01
5	9.18	0.0	18	35.71	0.0	30	60.20	6.000E-01	42	84.69	6.000E-01
6	11.22	0.0	19	37.75	0.0	31	62.24	6.000E-01	43	86.73	6.000E-01
7	13.27	0.0	20	39.80	0.0	32	64.29	6.000E-01	44	88.77	6.000E-01
8	15.31	0.0	21	41.84	0.0	33	66.33	6.000E-01	45	90.82	6.000E-01
9	17.35	0.0	22	43.88	0.0	34	68.37	6.000E-01	46	92.86	6.000E-01
10	19.39	0.0	23	45.92	0.0	35	70.41	6.000E-01	47	94.90	6.000E-01
11	21.43	0.0	24	47.96	0.0	36	72.45	6.000E-01	48	96.94	6.000E-01
12	23.47	0.0	25	50.00	0.0	37	74.49	6.000E-01	49	98.98	6.000E-01
13	25.51	0.0									

•••••••••••••••••••• A3 COEFFICIENT FOR FLOW EQUATION - REPRESENTS DEPTH OF FLOW IF A1 AND/OR A2 ARE ••••••••••••••••••••
•••••••••••••••••••• NOT SPECIFIED (OR ARE ZERO) ••••••••••••••••••••

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	0.0	38	76.53	0.0
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	0.0	39	78.57	0.0
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	0.0	40	80.61	0.0
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	0.0	41	82.65	0.0
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	0.0	42	84.69	0.0
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	0.0	43	86.73	0.0
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	0.0	44	88.77	0.0
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	0.0	45	90.82	0.0
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	0.0	46	92.86	0.0
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	0.0	47	94.90	0.0
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	0.0	48	96.94	0.0
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	0.0	49	98.98	0.0
13	25.51	1.500E+01									

•••••••••••••••••••• COMPUTED OXYGEN SATURATION CONCENTRATIONS (PPM) ••••••••••••••••••••

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.258E+00	15	28.57	8.258E+00	27	53.06	8.258E+00	39	77.55	8.258E+00
2	2.04	8.258E+00	16	30.61	8.258E+00	28	55.10	8.258E+00	40	79.59	8.258E+00
3	4.08	8.258E+00	17	32.65	8.258E+00	29	57.14	8.258E+00	41	81.63	8.258E+00
4	6.12	8.258E+00	18	34.69	8.258E+00	30	59.18	8.258E+00	42	83.67	8.258E+00
5	8.16	8.258E+00	19	36.73	8.258E+00	31	61.22	8.258E+00	43	85.71	8.258E+00
6	10.20	8.258E+00	20	38.78	8.258E+00	32	63.26	8.258E+00	44	87.75	8.258E+00
7	12.24	8.258E+00	21	40.82	8.258E+00	33	65.31	8.258E+00	45	89.80	8.258E+00
8	14.29	8.258E+00	22	42.86	8.258E+00	34	67.35	8.258E+00	46	91.84	8.258E+00
9	16.33	8.258E+00	23	44.90	8.258E+00	35	69.39	8.258E+00	47	93.88	8.258E+00

10	18.37	8.258E+00	24	46.94	8.258E+00	36	71.43	8.258E+00	48	95.92	8.258E+00
11	20.41	8.258E+00	25	48.98	8.258E+00	37	73.47	8.258E+00	49	97.96	8.258E+00
12	22.45	8.258E+00	26	51.02	8.258E+00	38	75.51	8.258E+00	50	100.00	8.258E+00
13	24.49	8.258E+00									
14	26.53	8.258E+00									

INITIAL TDS CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	3.373E+03	27	53.06	3.149E-01	39	77.55	0.0
2	2.04	1.856E+04	16	30.61	2.558E+03	28	55.10	0.0	40	79.59	0.0
3	4.08	1.712E+04	17	32.65	2.046E+03	29	57.14	0.0	41	81.63	0.0
4	6.12	1.568E+04	18	34.69	1.534E+03	30	59.18	0.0	42	83.67	0.0
5	8.16	1.425E+04	19	36.73	1.026E+03	31	61.22	0.0	43	85.71	0.0
6	10.20	1.281E+04	20	38.78	7.288E+02	32	63.26	0.0	44	87.75	0.0
7	12.24	1.154E+04	21	40.82	4.330E+02	33	65.31	0.0	45	89.80	0.0
8	14.29	1.028E+04	22	42.86	3.045E+02	34	67.35	0.0	46	91.84	0.0
9	16.33	9.016E+03	23	44.90	1.760E+02	35	69.39	0.0	47	93.88	0.0
10	18.37	7.954E+03	24	46.94	4.969E+01	36	71.43	0.0	48	95.92	0.0
11	20.41	6.891E+03	25	48.98	3.323E+01	37	73.47	0.0	49	97.96	0.0
12	22.45	5.829E+03	26	51.02	1.677E+01	38	75.51	0.0	50	100.00	0.0
13	24.49	5.006E+03									
14	26.53	4.189E+03									

INITIAL CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	5.714E-02	27	53.06	1.987E-01	39	77.55	1.031E+00
2	2.04	4.082E-03	16	30.61	6.122E-02	28	55.10	2.741E-01	40	79.59	1.246E+00
3	4.08	8.163E-03	17	32.65	6.531E-02	29	57.14	3.497E-01	41	81.63	1.498E+00
4	6.12	1.224E-02	18	34.69	6.939E-02	30	59.18	4.253E-01	42	83.67	1.750E+00
5	8.16	1.633E-02	19	36.73	7.347E-02	31	61.22	5.024E-01	43	85.71	2.003E+00
6	10.20	2.041E-02	20	38.78	7.755E-02	32	63.26	7.015E-01	44	87.75	2.404E+00
7	12.24	2.449E-02	21	40.82	8.163E-02	33	65.31	9.006E-01	45	89.80	2.806E+00
8	14.29	2.857E-02	22	42.86	8.571E-02	34	67.35	1.100E+00	46	91.84	3.209E+00
9	16.33	3.265E-02	23	44.90	8.980E-02	35	69.39	1.299E+00	47	93.88	3.732E+00
10	18.37	3.673E-02	24	46.94	9.388E-02	36	71.43	1.632E+00	48	95.92	4.255E+00
11	20.41	4.082E-02	25	48.98	9.796E-02	37	73.47	1.967E+00	49	97.96	4.777E+00
12	22.45	4.490E-02	26	51.02	1.329E-01	38	75.51	2.294E+00	50	100.00	5.300E+00
13	24.49	4.898E-02									
14	26.53	5.306E-02									

INITIAL NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	2.857E-01	27	53.06	7.587E-01	39	77.55	2.228E+00
2	2.04	2.041E-02	16	30.61	3.061E-01	28	55.10	9.311E-01	40	79.59	2.399E+00
3	4.08	4.082E-02	17	32.65	3.265E-01	29	57.14	1.104E+00	41	81.63	2.673E+00
4	6.12	6.122E-02	18	34.69	3.469E-01	30	59.18	1.302E+00	42	83.67	2.946E+00
5	8.16	8.163E-02	19	36.73	3.673E-01	31	61.22	1.500E+00	43	85.71	3.220E+00
6	10.20	1.020E-01	20	38.78	3.878E-01	32	63.26	1.699E+00	44	87.75	3.494E+00
7	12.24	1.224E-01	21	40.82	4.082E-01	33	65.31	1.897E+00	45	89.80	3.827E+00
8	14.29	1.429E-01	22	42.86	4.286E-01	34	67.35	2.095E+00	46	91.84	4.162E+00
9	16.33	1.633E-01	23	44.90	4.490E-01	35	69.39	2.419E+00	47	93.88	4.496E+00
10	18.37	1.837E-01	24	46.94	4.694E-01	36	71.43	2.746E+00	48	95.92	4.864E+00
11	20.41	2.041E-01	25	48.98	4.898E-01	37	73.47	3.074E+00	49	97.96	5.232E+00
12	22.45	2.245E-01	26	51.02	5.862E-01	38	75.51	3.394E+00	50	100.00	5.600E+00
13	24.49	2.449E-01									

14 26.53 2.653E-01

********** INITIAL DISSOLVED OXYGEN CONCENTRATIONS (PPM) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.300E+00	15	28.57	8.300E+00	27	53.06	6.648E+00	39	77.55	6.681E+00
2	2.04	8.300E+00	16	30.61	8.294E+00	28	55.10	6.366E+00	40	79.59	6.651E+00
3	4.08	8.300E+00	17	32.65	8.199E+00	29	57.14	6.084E+00	41	81.63	6.601E+00
4	6.12	8.300E+00	18	34.69	8.099E+00	30	59.18	5.802E+00	42	83.67	6.551E+00
5	8.16	8.300E+00	19	36.73	7.999E+00	31	61.22	5.721E+00	43	85.71	6.500E+00
6	10.20	8.300E+00	20	38.78	7.899E+00	32	63.26	5.641E+00	44	87.75	6.450E+00
7	12.24	8.300E+00	21	40.82	7.799E+00	33	65.31	5.561E+00	45	89.80	6.400E+00
8	14.29	8.300E+00	22	42.86	7.698E+00	34	67.35	5.481E+00	46	91.84	6.340E+00
9	16.33	8.300E+00	23	44.90	7.598E+00	35	69.39	5.400E+00	47	93.88	6.280E+00
10	18.37	8.300E+00	24	46.94	7.495E+00	36	71.43	5.566E+00	48	95.92	6.220E+00
11	20.41	8.300E+00	25	48.98	7.213E+00	37	73.47	5.734E+00	49	97.96	6.160E+00
12	22.45	8.300E+00	26	51.02	6.931E+00	38	75.51	5.904E+00	50	100.00	6.100E+00
13	24.49	8.300E+00									
14	26.53	8.300E+00									

DEPTH OR VELOCITY DEPENDENT VARIABLES,
BASED ON FLOWS FOR THE PERIOD JAN. 1, 1973 THRU JAN. 5, 1973

CROSSECTIONAL AREAS OF CHANNELS (SQFT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	4.788E+04	38	76.53	3.177E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	4.666E+04	39	78.57	3.062E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	4.545E+04	40	80.61	2.946E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	4.424E+04	41	82.65	2.831E+04
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	4.303E+04	42	84.69	2.715E+04
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	4.182E+04	43	86.73	2.600E+04
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	4.061E+04	44	88.77	2.484E+04
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	3.939E+04	45	90.82	2.369E+04
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	3.818E+04	46	92.86	2.253E+04
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	3.697E+04	47	94.90	2.138E+04
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	3.576E+04	48	96.94	2.022E+04
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	3.455E+04	49	98.98	1.907E+04
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	9.575E+00	38	76.53	6.354E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	9.333E+00	39	78.57	6.123E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	9.090E+00	40	80.61	5.892E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	8.848E+00	41	82.65	5.661E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	8.606E+00	42	84.69	5.430E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	8.363E+00	43	86.73	5.199E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	8.121E+00	44	88.77	4.969E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	7.879E+00	45	90.82	4.737E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	7.636E+00	46	92.86	4.506E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	7.394E+00	47	94.90	4.275E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	7.152E+00	48	96.94	4.044E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	6.909E+00	49	98.98	3.813E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	1.358E-01	38	76.53	1.889E-01
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	1.393E-01	39	78.57	1.960E-01
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	1.430E-01	40	80.61	2.037E-01
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	1.469E-01	41	82.65	2.120E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	1.511E-01	42	84.69	2.210E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	1.554E-01	43	86.73	2.308E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	1.601E-01	44	88.77	2.415E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	1.650E-01	45	90.82	2.533E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	1.702E-01	46	92.86	2.663E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	1.758E-01	47	94.90	2.807E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	1.818E-01	48	96.94	2.967E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	1.882E-01	49	98.98	3.147E-01
13	25.51	1.500E+00									

********** JUNCTION VOLUMES (CUFT) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09	15	28.57	1.156E+09	27	53.06	5.098E+08	39	77.55	3.364E+08
2	2.04	1.585E+09	16	30.61	1.123E+09	28	55.10	4.968E+08	40	79.59	3.240E+08
3	4.08	1.552E+09	17	32.65	1.090E+09	29	57.14	4.837E+08	41	81.63	3.115E+08
4	6.12	1.519E+09	18	34.69	1.057E+09	30	59.18	4.706E+08	42	83.67	2.991E+08
5	8.16	1.486E+09	19	36.73	1.024E+09	31	61.22	4.576E+08	43	85.71	2.866E+08
6	10.20	1.453E+09	20	38.78	9.905E+08	32	63.26	4.445E+08	44	87.75	2.742E+08
7	12.24	1.420E+09	21	40.82	9.575E+08	33	65.31	4.314E+08	45	89.80	2.617E+08
8	14.29	1.387E+09	22	42.86	9.245E+08	34	67.35	4.183E+08	46	91.84	2.492E+08
9	16.33	1.354E+09	23	44.90	8.915E+08	35	69.39	4.053E+08	47	93.88	2.368E+08
10	18.37	1.321E+09	24	46.94	8.585E+08	36	71.43	3.922E+08	48	95.92	2.243E+08
11	20.41	1.288E+09	25	48.98	8.254E+08	37	73.47	3.791E+08	49	97.96	2.119E+08
12	22.45	1.255E+09	26	51.02	6.627E+08	38	75.51	3.576E+08	50	100.00	2.056E+08
13	24.49	1.222E+09									
14	26.53	1.189E+09									

********** COMPUTED REAERATION RATES (1/DAY) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01	15	28.57	3.062E-01	27	53.06	1.854E-01	39	77.55	4.092E-01
2	2.04	3.062E-01	16	30.61	3.062E-01	28	55.10	1.953E-01	40	79.59	4.413E-01
3	4.08	3.062E-01	17	32.65	3.062E-01	29	57.14	2.060E-01	41	81.63	4.774E-01
4	6.12	3.062E-01	18	34.69	3.062E-01	30	59.18	2.176E-01	42	83.67	5.180E-01
5	8.16	3.062E-01	19	36.73	3.062E-01	31	61.22	2.302E-01	43	85.71	5.641E-01
6	10.20	3.062E-01	20	38.78	3.062E-01	32	63.26	2.439E-01	44	87.75	6.166E-01
7	12.24	3.062E-01	21	40.82	3.062E-01	33	65.31	2.589E-01	45	89.80	6.768E-01
8	14.29	3.062E-01	22	42.86	3.062E-01	34	67.35	2.754E-01	46	91.84	7.463E-01
9	16.33	3.062E-01	23	44.90	3.062E-01	35	69.39	2.934E-01	47	93.88	8.270E-01
10	18.37	3.062E-01	24	46.94	3.062E-01	36	71.43	3.133E-01	48	95.92	9.216E-01
11	20.41	3.062E-01	25	48.98	3.062E-01	37	73.47	3.353E-01	49	97.96	1.034E+00
12	22.45	3.062E-01	26	51.02	2.434E-01	38	75.51	3.705E-01	50	100.00	1.094E+00
13	24.49	3.062E-01									
14	26.53	3.062E-01									

FLOW CONDITIONS FOR JAN. 1, 1973 THRU JAN. 5, 1973

NUMBER OF DAYS IN THIS PERIOD = 5
TOTAL INFLOWS = 6500.00 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 6500.00 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	6.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	6.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-6.500E+03	14	27.55	-6.500E+03	26	52.04	-6.500E+03	38	76.53	-6.000E+03
2	3.06	-6.500E+03	15	29.59	-6.500E+03	27	54.08	-6.500E+03	39	78.57	-6.000E+03
3	5.10	-6.500E+03	16	31.63	-6.500E+03	28	56.12	-6.500E+03	40	80.61	-6.000E+03
4	7.14	-6.500E+03	17	33.67	-6.500E+03	29	58.16	-6.500E+03	41	82.65	-6.000E+03
5	9.18	-6.500E+03	18	35.71	-6.500E+03	30	60.20	-6.500E+03	42	84.69	-6.000E+03
6	11.22	-6.500E+03	19	37.75	-6.500E+03	31	62.24	-6.500E+03	43	86.73	-6.000E+03
7	13.27	-6.500E+03	20	39.80	-6.500E+03	32	64.29	-6.500E+03	44	88.77	-6.000E+03
8	15.31	-6.500E+03	21	41.84	-6.500E+03	33	66.33	-6.500E+03	45	90.82	-6.000E+03

9	17.35	-6.500E+03	22	43.88	-6.500E+03	34	68.37	-6.500E+03	46	92.86	-6.000E+03
10	19.39	-6.500E+03	23	45.92	-6.500E+03	35	70.41	-6.500E+03	47	94.90	-6.000E+03
11	21.43	-6.500E+03	24	47.96	-6.500E+03	36	72.45	-6.500E+03	48	96.94	-6.000E+03
12	23.47	-6.500E+03	25	50.00	-6.500E+03	37	74.49	-6.500E+03	49	98.98	-6.000E+03
13	25.51	-6.500E+03									

TDS INPUT CONCENTRATIONS FOR JAN. 1, 1973 THRU JAN. 5, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS
JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 1.8000E+04 (PPM)

AUTOQD - TEST PROBLEM

TDS CONCENTRATIONS FOR THE PERIOD JAN. 1, 1973 THRU JAN. 5, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

TDS CONCENTRATIONS (PPM) ON JAN. 1, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	3.283E+03	27	53.06	5.667E-01	39	77.55	1.340E-25
2	2.04	1.708E+04	16	30.61	2.588E+03	28	55.10	2.226E-02	40	79.59	3.532E-28
3	4.08	1.611E+04	17	32.65	1.982E+03	29	57.14	5.711E-04	41	81.63	8.006E-31
4	6.12	1.506E+04	18	34.69	1.464E+03	30	59.18	1.046E-05	42	83.67	1.563E-33
5	8.16	1.390E+04	19	36.73	1.036E+03	31	61.22	1.444E-07	43	85.71	2.627E-36
6	10.20	1.268E+04	20	38.78	6.989E+02	32	63.26	1.562E-09	44	87.75	3.801E-39
7	12.24	1.143E+04	21	40.82	4.482E+02	33	65.31	1.358E-11	45	89.80	4.727E-42
8	14.29	1.019E+04	22	42.86	2.714E+02	34	67.35	9.668E-14	46	91.84	5.040E-45
9	16.33	9.003E+03	23	44.90	1.452E+02	35	69.39	5.717E-16	47	93.88	4.593E-48
10	18.37	7.874E+03	24	46.94	6.216E+01	36	71.43	2.839E-18	48	95.92	3.560E-51
11	20.41	6.814E+03	25	48.98	2.638E+01	37	73.47	1.193E-20	49	97.96	2.333E-54
12	22.45	5.825E+03	26	51.02	8.099E+00	38	75.51	4.364E-23	50	100.00	1.246E-57
13	24.49	4.907E+03									
14	26.53	4.059E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 2, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	3.224E+03	27	53.06	4.238E-01	39	77.55	5.849E-22
2	2.04	1.690E+04	16	30.61	2.540E+03	28	55.10	2.689E-02	40	79.59	3.873E-24
3	4.08	1.580E+04	17	32.65	1.942E+03	29	57.14	1.221E-03	41	81.63	2.277E-26
4	6.12	1.469E+04	18	34.69	1.433E+03	30	59.18	4.178E-05	42	83.67	1.193E-28
5	8.16	1.356E+04	19	36.73	1.015E+03	31	61.22	1.121E-06	43	85.71	5.579E-31
6	10.20	1.240E+04	20	38.78	6.836E+02	32	63.26	2.432E-08	44	87.75	2.336E-33
7	12.24	1.123E+04	21	40.82	4.339E+02	33	65.31	4.364E-10	45	89.80	8.771E-36
8	14.29	1.005E+04	22	42.86	2.547E+02	34	67.35	6.586E-12	46	91.84	2.957E-38
9	16.33	8.905E+03	23	44.90	1.333E+02	35	69.39	8.477E-14	47	93.88	8.957E-41
10	18.37	7.797E+03	24	46.94	5.914E+01	36	71.43	9.406E-16	48	95.92	2.440E-43
11	20.41	6.744E+03	25	48.98	2.148E+01	37	73.47	9.075E-18	49	97.96	5.977E-46
12	22.45	5.755E+03	26	51.02	4.593E+00	38	75.51	7.809E-20	50	100.00	1.285E-48
13	24.49	4.835E+03									
14	26.53	3.990E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 3, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	3.170E+03	27	53.06	2.870E-01	39	77.55	3.277E-20
2	2.04	1.681E+04	16	30.61	2.494E+03	28	55.10	2.225E-02	40	79.59	3.396E-22
3	4.08	1.564E+04	17	32.65	1.905E+03	29	57.14	1.340E-03	41	81.63	3.148E-24
4	6.12	1.449E+04	18	34.69	1.404E+03	30	59.18	6.350E-05	42	83.67	2.617E-26
5	8.16	1.334E+04	19	36.73	9.922E+02	31	61.22	2.423E-06	43	85.71	1.958E-28
6	10.20	1.218E+04	20	38.78	6.658E+02	32	63.26	7.608E-08	44	87.75	1.320E-30

7	12.24	1.103E+04	21	40.82	4.189E+02	33	65.31	2.003E-09	45	89.80	8.043E-33
8	14.29	9.895E+03	22	42.86	2.423E+02	34	67.35	4.486E-11	46	91.84	4.431E-35
9	16.33	8.778E+03	23	44.90	1.247E+02	35	69.39	8.653E-13	47	93.88	2.210E-37
10	18.37	7.695E+03	24	46.94	5.414E+01	36	71.43	1.452E-14	48	95.92	9.986E-40
11	20.41	6.658E+03	25	48.98	1.791E+01	37	73.47	2.135E-16	49	97.96	4.088E-42
12	22.45	5.680E+03	26	51.02	2.992E+00	38	75.51	2.815E-18	50	100.00	1.484E-44
13	24.49	4.768E+03									
14	26.53	3.930E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 4, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	3.119E+03	27	53.06	1.984E-01	39	77.55	3.637E-19
2	2.04	1.675E+04	16	30.61	2.451E+03	28	55.10	1.647E-02	40	79.59	5.049E-21
3	4.08	1.554E+04	17	32.65	1.869E+03	29	57.14	1.152E-03	41	81.63	6.288E-23
4	6.12	1.435E+04	18	34.69	1.376E+03	30	59.18	6.639E-05	42	83.67	7.044E-25
5	8.16	1.318E+04	19	36.73	9.696E+02	31	61.22	3.166E-06	43	85.71	7.119E-27
6	10.20	1.202E+04	20	38.78	6.481E+02	32	63.26	1.264E-07	44	87.75	6.504E-29
7	12.24	1.087E+04	21	40.82	4.050E+02	33	65.31	4.283E-09	45	89.80	5.379E-31
8	14.29	9.747E+03	22	42.86	2.317E+02	34	67.35	1.245E-10	46	91.84	4.033E-33
9	16.33	8.648E+03	23	44.90	1.173E+02	35	69.39	3.137E-12	47	93.88	2.743E-35
10	18.37	7.584E+03	24	46.94	4.955E+01	36	71.43	6.914E-14	48	95.92	1.693E-37
11	20.41	6.565E+03	25	48.98	1.535E+01	37	73.47	1.342E-15	49	97.96	9.488E-40
12	22.45	5.600E+03	26	51.02	2.174E+00	38	75.51	2.340E-17	50	100.00	4.738E-42
13	24.49	4.699E+03									
14	26.53	3.870E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 5, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	3.069E+03	27	53.06	1.451E-01	39	77.55	1.723E-18
2	2.04	1.671E+04	16	30.61	2.409E+03	28	55.10	1.198E-02	40	79.59	2.962E-20
3	4.08	1.547E+04	17	32.65	1.835E+03	29	57.14	8.956E-04	41	81.63	4.573E-22
4	6.12	1.425E+04	18	34.69	1.348E+03	30	59.18	5.799E-05	42	83.67	6.363E-24
5	8.16	1.305E+04	19	36.73	9.477E+02	31	61.22	3.205E-06	43	85.71	7.995E-26
6	10.20	1.188E+04	20	38.78	6.310E+02	32	63.26	1.512E-07	44	87.75	9.091E-28
7	12.24	1.074E+04	21	40.82	3.920E+02	33	65.31	6.123E-09	45	89.80	9.368E-30
8	14.29	9.616E+03	22	42.86	2.222E+02	34	67.35	2.147E-10	46	91.84	8.756E-32
9	16.33	8.527E+03	23	44.90	1.109E+02	35	69.39	6.570E-12	47	93.88	7.429E-34
10	18.37	7.476E+03	24	46.94	4.573E+01	36	71.43	1.767E-13	48	95.92	5.722E-36
11	20.41	6.470E+03	25	48.98	1.350E+01	37	73.47	4.201E-15	49	97.96	4.000E-38
12	22.45	5.519E+03	26	51.02	1.713E+00	38	75.51	8.974E-17	50	100.00	2.499E-40
13	24.49	4.630E+03									
14	26.53	3.811E+03									

CBOD, NBOD AND DO INPUT CONC. FOR JAN. 1, 1973 THRU JAN. 5, 1973

CBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

NBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

DO INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0

12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+00	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

AUTOQD - TEST PROBLEM

CBOD, NBOD AND DO CONC FOR THE PERIOD JAN. 1, 1973 THRU JAN. 5, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 1, 1973

CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	5.613E-03	15	28.57	4.363E-02	27	53.06	2.128E-01	39	77.55	1.087E+00
2	2.04	6.476E-03	16	30.61	4.674E-02	28	55.10	2.744E-01	40	79.59	1.262E+00
3	4.08	8.116E-03	17	32.65	4.985E-02	29	57.14	3.451E-01	41	81.63	1.495E+00
4	6.12	1.036E-02	18	34.69	5.296E-02	30	59.18	4.380E-01	42	83.67	1.768E+00
5	8.16	1.301E-02	19	36.73	5.608E-02	31	61.22	5.661E-01	43	85.71	2.088E+00
6	10.20	1.590E-02	20	38.78	5.921E-02	32	63.26	7.238E-01	44	87.75	2.450E+00
7	12.24	1.891E-02	21	40.82	6.239E-02	33	65.31	8.952E-01	45	89.80	2.847E+00
8	14.29	2.197E-02	22	42.86	6.579E-02	34	67.35	1.092E+00	46	91.84	3.282E+00
9	16.33	2.506E-02	23	44.90	7.020E-02	35	69.39	1.323E+00	47	93.88	3.749E+00
10	18.37	2.814E-02	24	46.94	7.849E-02	36	71.43	1.575E+00	48	95.92	4.251E+00
11	20.41	3.124E-02	25	48.98	9.906E-02	37	73.47	1.832E+00	49	97.96	4.793E+00
12	22.45	3.433E-02	26	51.02	1.482E-01	38	75.51	2.126E+00	50	100.00	5.370E+00
13	24.49	3.743E-02									
14	26.53	4.053E-02									

NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.184E-02	15	28.57	2.481E-01	27	53.06	8.123E-01	39	77.55	2.231E+00
2	2.04	3.676E-02	16	30.61	2.658E-01	28	55.10	9.717E-01	40	79.59	2.430E+00
3	4.08	4.609E-02	17	32.65	2.835E-01	29	57.14	1.139E+00	41	81.63	2.684E+00
4	6.12	5.887E-02	18	34.69	3.012E-01	30	59.18	1.314E+00	42	83.67	2.950E+00
5	8.16	7.396E-02	19	36.73	3.189E-01	31	61.22	1.493E+00	43	85.71	3.236E+00
6	10.20	9.040E-02	20	38.78	3.367E-01	32	63.26	1.685E+00	44	87.75	3.543E+00
7	12.24	1.075E-01	21	40.82	3.546E-01	33	65.31	1.904E+00	45	89.80	3.868E+00
8	14.29	1.249E-01	22	42.86	3.731E-01	34	67.35	2.162E+00	46	91.84	4.207E+00
9	16.33	1.425E-01	23	44.90	3.945E-01	35	69.39	2.444E+00	47	93.88	4.558E+00
10	18.37	1.600E-01	24	46.94	4.266E-01	36	71.43	2.719E+00	48	95.92	4.916E+00
11	20.41	1.776E-01	25	48.98	4.925E-01	37	73.47	2.981E+00	49	97.96	5.275E+00
12	22.45	1.952E-01	26	51.02	6.355E-01	38	75.51	3.248E+00	50	100.00	5.631E+00
13	24.49	2.128E-01									
14	26.53	2.305E-01									

DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.373E+00	15	28.57	8.245E+00	27	53.06	6.445E+00	39	77.55	6.547E+00
2	2.04	8.370E+00	16	30.61	8.205E+00	28	55.10	6.177E+00	40	79.59	6.596E+00
3	4.08	8.365E+00	17	32.65	8.148E+00	29	57.14	5.950E+00	41	81.63	6.537E+00
4	6.12	8.359E+00	18	34.69	8.077E+00	30	59.18	5.781E+00	42	83.67	6.457E+00

5	8.16	8.353E+00	19	36.73	7.998E+00	31	61.22	5.654E+00	43	85.71	6.376E+00
6	10.20	8.345E+00	20	38.78	7.916E+00	32	63.26	5.530E+00	44	87.75	6.247E+00
7	12.24	8.338E+00	21	40.82	7.832E+00	33	65.31	5.425E+00	45	89.80	6.225E+00
8	14.29	8.331E+00	22	42.86	7.741E+00	34	67.35	5.362E+00	46	91.84	6.164E+00
9	16.33	8.323E+00	23	44.90	7.632E+00	35	69.39	5.366E+00	47	93.88	6.116E+00
10	18.37	8.316E+00	24	46.94	7.475E+00	36	71.43	5.445E+00	48	95.92	6.078E+00
11	20.41	8.308E+00	25	48.98	7.226E+00	37	73.47	5.604E+00	49	97.96	6.045E+00
12	22.45	8.299E+00	26	51.02	6.834E+00	38	75.51	5.872E+00	50	100.00	6.005E+00
13	24.49	8.288E+00									
14	26.53	8.272E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 2, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	6.403E-03	15	28.57	3.332E-02	27	53.06	2.177E-01	39	77.55	1.104E+00
2	2.04	6.876E-03	16	30.61	3.569E-02	28	55.10	2.800E-01	40	79.59	1.280E+00
3	4.08	7.803E-03	17	32.65	3.806E-02	29	57.14	3.591E-01	41	81.63	1.525E+00
4	6.12	9.130E-03	18	34.69	4.045E-02	30	59.18	4.603E-01	42	83.67	1.807E+00
5	8.16	1.079E-02	19	36.73	4.289E-02	31	61.22	5.833E-01	43	85.71	2.126E+00
6	10.20	1.270E-02	20	38.78	4.547E-02	32	63.26	7.255E-01	44	87.75	2.481E+00
7	12.24	1.479E-02	21	40.82	4.845E-02	33	65.31	8.871E-01	45	89.80	2.871E+00
8	14.29	1.699E-02	22	42.86	5.260E-02	34	67.35	1.070E+00	46	91.84	3.299E+00
9	16.33	1.927E-02	23	44.90	5.980E-02	35	69.39	1.275E+00	47	93.88	3.764E+00
10	18.37	2.158E-02	24	46.94	7.414E-02	36	71.43	1.508E+00	48	95.92	4.267E+00
11	20.41	2.391E-02	25	48.98	1.030E-01	37	73.47	1.782E+00	49	97.96	4.804E+00
12	22.45	2.626E-02	26	51.02	1.561E-01	38	75.51	2.118E+00	50	100.00	5.374E+00
13	24.49	2.861E-02									
14	26.53	3.096E-02									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.131E-02	15	28.57	2.155E-01	27	53.06	8.459E-01	39	77.55	2.243E+00
2	2.04	4.438E-02	16	30.61	2.308E-01	28	55.10	9.946E-01	40	79.59	2.444E+00
3	4.08	5.038E-02	17	32.65	2.461E-01	29	57.14	1.150E+00	41	81.63	2.700E+00
4	6.12	5.898E-02	18	34.69	2.615E-01	30	59.18	1.315E+00	42	83.67	2.976E+00
5	8.16	6.971E-02	19	36.73	2.771E-01	31	61.22	1.495E+00	43	85.71	3.271E+00
6	10.20	8.208E-02	20	38.78	2.931E-01	32	63.26	1.697E+00	44	87.75	3.584E+00
7	12.24	9.560E-02	21	40.82	3.105E-01	33	65.31	1.923E+00	45	89.80	3.910E+00
8	14.29	1.099E-01	22	42.86	3.314E-01	34	67.35	2.164E+00	46	91.84	4.245E+00
9	16.33	1.246E-01	23	44.90	3.618E-01	35	69.39	2.409E+00	47	93.88	4.588E+00
10	18.37	1.395E-01	24	46.94	4.141E-01	36	71.43	2.659E+00	48	95.92	4.934E+00
11	20.41	1.546E-01	25	48.98	5.097E-01	37	73.47	2.929E+00	49	97.96	5.283E+00
12	22.45	1.698E-01	26	51.02	6.738E-01	38	75.51	3.232E+00	50	100.00	5.633E+00
13	24.49	1.850E-01									
14	26.53	2.002E-01									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.419E+00	15	28.57	8.221E+00	27	53.06	6.303E+00	39	77.55	6.486E+00
2	2.04	8.415E+00	16	30.61	8.180E+00	28	55.10	6.071E+00	40	79.59	6.534E+00
3	4.08	8.409E+00	17	32.65	8.131E+00	29	57.14	5.880E+00	41	81.63	6.460E+00
4	6.12	8.400E+00	18	34.69	8.074E+00	30	59.18	5.716E+00	42	83.67	6.365E+00
5	8.16	8.390E+00	19	36.73	8.010E+00	31	61.22	5.569E+00	43	85.71	6.277E+00
6	10.20	8.379E+00	20	38.78	7.939E+00	32	63.26	5.440E+00	44	87.75	6.202E+00

7	12.24	8.368E+00	21	40.82	7.862E+00	33	65.31	5.346E+00	45	89.80	6.142E+00
8	14.29	8.355E+00	22	42.86	7.769E+00	34	67.35	5.301E+00	46	91.84	6.049E+00
9	16.33	8.343E+00	23	44.90	7.646E+00	35	69.39	5.318E+00	47	93.88	6.070E+00
10	18.37	8.329E+00	24	46.94	7.464E+00	36	71.43	5.404E+00	48	95.92	6.051E+00
11	20.41	8.315E+00	25	48.98	7.177E+00	37	73.47	5.569E+00	49	97.96	6.032E+00
12	22.45	8.298E+00	26	51.02	6.712E+00	38	75.51	5.826E+00	50	100.00	6.002E+00
13	24.49	8.278E+00									
14	26.53	8.253E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 3, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	6.090E-03	15	28.57	2.546E-02	27	53.06	2.242E-01	39	77.55	1.123E+00
2	2.04	6.387E-03	16	30.61	2.727E-02	28	55.10	2.896E-01	40	79.59	1.303E+00
3	4.08	6.974E-03	17	32.65	2.912E-02	29	57.14	3.706E-01	41	81.63	1.550E+00
4	6.12	7.830E-03	18	34.69	3.104E-02	30	59.18	4.684E-01	42	83.67	1.831E+00
5	8.16	8.921E-03	19	36.73	3.315E-02	31	61.22	5.829E-01	43	85.71	2.146E+00
6	10.20	1.021E-02	20	38.78	3.569E-02	32	63.26	7.144E-01	44	87.75	2.496E+00
7	12.24	1.166E-02	21	40.82	3.923E-02	33	65.31	8.649E-01	45	89.80	2.883E+00
8	14.29	1.322E-02	22	42.86	4.494E-02	34	67.35	1.038E+00	46	91.84	3.308E+00
9	16.33	1.487E-02	23	44.90	5.508E-02	35	69.39	1.242E+00	47	93.88	3.770E+00
10	18.37	1.658E-02	24	46.94	7.357E-02	36	71.43	1.485E+00	48	95.92	4.270E+00
11	20.41	1.832E-02	25	48.98	1.064E-01	37	73.47	1.778E+00	49	97.96	4.806E+00
12	22.45	2.009E-02	26	51.02	1.614E-01	38	75.51	2.128E+00	50	100.00	5.374E+00
13	24.49	2.187E-02									
14	26.53	2.366E-02									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.469E-02	15	28.57	1.872E-01	27	53.06	8.644E-01	39	77.55	2.258E+00
2	2.04	4.688E-02	16	30.61	2.005E-01	28	55.10	1.005E+00	40	79.59	2.464E+00
3	4.08	5.121E-02	17	32.65	2.139E-01	29	57.14	1.155E+00	41	81.63	2.726E+00
4	6.12	5.751E-02	18	34.69	2.276E-01	30	59.18	1.319E+00	42	83.67	3.007E+00
5	8.16	6.555E-02	19	36.73	2.420E-01	31	61.22	1.501E+00	43	85.71	3.30JE+00
6	10.20	7.505E-02	20	38.78	2.579E-01	32	63.26	1.700E+00	44	87.75	3.613E+00
7	12.24	8.570E-02	21	40.82	2.774E-01	33	65.31	1.913E+00	45	89.80	3.933E+00
8	14.29	9.723E-02	22	42.86	3.043E-01	34	67.35	2.137E+00	46	91.84	4.261E+00
9	16.33	1.094E-01	23	44.90	3.463E-01	35	69.39	2.374E+00	47	93.88	4.597E+00
10	18.37	1.219E-01	24	46.94	4.157E-01	36	71.43	2.632E+00	48	95.92	4.938E+00
11	20.41	1.347E-01	25	48.98	5.287E-01	37	73.47	2.920E+00	49	97.96	5.284E+00
12	22.45	1.477E-01	26	51.02	6.998E-01	38	75.51	3.238E+00	50	100.00	5.634E+00
13	24.49	1.608E-01									
14	26.53	1.740E-01									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.450E+00	15	28.57	8.216E+00	27	53.06	6.211E+00	39	77.55	6.432E+00
2	2.04	8.446E+00	16	30.61	8.177E+00	28	55.10	5.999E+00	40	79.59	6.474E+00
3	4.08	8.438E+00	17	32.65	8.133E+00	29	57.14	5.816E+00	41	81.63	6.396E+00
4	6.12	8.429E+00	18	34.69	8.083E+00	30	59.18	5.650E+00	42	83.67	6.304E+00
5	8.16	8.417E+00	19	36.73	8.027E+00	31	61.22	5.504E+00	43	85.71	6.225E+00
6	10.20	8.404E+00	20	38.78	7.962E+00	32	63.26	5.386E+00	44	87.75	6.161E+00
7	12.24	8.390E+00	21	40.82	7.884E+00	33	65.31	5.308E+00	45	89.80	6.114E+00
8	14.29	8.374E+00	22	42.86	7.785E+00	34	67.35	5.278E+00	46	91.84	6.082E+00

9	16.33	8.358E+00	23	44.90	7.645E+00	35	69.39	5.301E+00	47	93.88	6.062E+00
10	18.37	8.341E+00	24	46.94	7.436E+00	36	71.43	5.384E+00	48	95.92	6.047E+00
11	20.41	8.322E+00	25	48.98	7.111E+00	37	73.47	5.537E+00	49	97.96	6.031E+00
12	22.45	8.301E+00	26	51.02	6.612E+00	38	75.51	5.783E+00	50	100.00	6.002E+00
13	24.49	8.276E+00									
14	26.53	8.248E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 4, 1973

••••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	5.396E-03	15	28.57	1.949E-02	27	53.06	2.306E-01	39	77.55	1.139E+00
2	2.04	5.593E-03	16	30.61	2.092E-02	28	55.10	2.958E-01	40	79.59	1.320E+00
3	4.08	5.984E-03	17	32.65	2.245E-02	29	57.14	3.738E-01	41	81.63	1.565E+00
4	6.12	6.560E-03	18	34.69	2.416E-02	30	59.18	4.659E-01	42	83.67	1.843E+00
5	8.16	7.303E-03	19	36.73	2.625E-02	31	61.22	5.731E-01	43	85.71	2.155E+00
6	10.20	8.193E-03	20	38.78	2.913E-02	32	63.26	6.979E-01	44	87.75	2.503E+00
7	12.24	9.208E-03	21	40.82	3.353E-02	33	65.31	8.447E-01	45	89.80	2.888E+00
8	14.29	1.032E-02	22	42.86	4.080E-02	34	67.35	1.020E+00	46	91.84	3.311E+00
9	16.33	1.152E-02	23	44.90	5.322E-02	35	69.39	1.231E+00	47	93.88	3.772E+00
10	18.37	1.277E-02	24	46.94	7.436E-02	36	71.43	1.485E+00	48	95.92	4.271E+00
11	20.41	1.406E-02	25	48.98	1.095E-01	37	73.47	1.787E+00	49	97.96	4.806E+00
12	22.45	1.538E-02	26	51.02	1.664E-01	38	75.51	2.141E+00	50	100.00	5.375E+00
13	24.49	1.673E-02									
14	26.53	1.809E-02									

••••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.503E-02	15	28.57	1.627E-01	27	53.06	8.741E-01	39	77.55	2.277E+00
2	2.04	4.669E-02	16	30.61	1.745E-01	28	55.10	1.011E+00	40	79.59	2.487E+00
3	4.08	4.997E-02	17	32.65	1.866E-01	29	57.14	1.159E+00	41	81.63	2.750E+00
4	6.12	5.479E-02	18	34.69	1.994E-01	30	59.18	1.321E+00	42	83.67	3.030E+00
5	8.16	6.101E-02	19	36.73	2.138E-01	31	61.22	1.498E+00	43	85.71	3.323E+00
6	10.20	6.847E-02	20	38.78	2.313E-01	32	63.26	1.689E+00	44	87.75	3.627E+00
7	12.24	7.697E-02	21	40.82	2.546E-01	33	65.31	1.894E+00	45	89.80	3.941E+00
8	14.29	8.631E-02	22	42.86	2.886E-01	34	67.35	2.115E+00	46	91.84	4.266E+00
9	16.33	9.630E-02	23	44.90	3.410E-01	35	69.39	2.358E+00	47	93.88	4.598E+00
10	18.37	1.068E-01	24	46.94	4.223E-01	36	71.43	2.628E+00	48	95.92	4.938E+00
11	20.41	1.176E-01	25	48.98	5.444E-01	37	73.47	2.926E+00	49	97.96	5.284E+00
12	22.45	1.286E-01	26	51.02	7.157E-01	38	75.51	3.252E+00	50	100.00	5.634E+00
13	24.49	1.399E-01									
14	26.53	1.512E-01									

••••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.471E+00	15	28.57	8.221E+00	27	53.06	6.145E+00	39	77.55	6.387E+00
2	2.04	8.457E+00	16	30.61	8.185E+00	28	55.10	5.942E+00	40	79.59	6.431E+00
3	4.08	8.459E+00	17	32.65	8.144E+00	29	57.14	5.763E+00	41	81.63	6.358E+00
4	6.12	8.449E+00	18	34.69	8.098E+00	30	59.18	5.604E+00	42	83.67	6.273E+00
5	8.16	8.437E+00	19	36.73	8.044E+00	31	61.22	5.469E+00	43	85.71	6.203E+00
6	10.20	8.422E+00	20	38.78	7.980E+00	32	63.26	5.365E+00	44	87.75	6.148E+00
7	12.24	8.407E+00	21	40.82	7.899E+00	33	65.31	5.297E+00	45	89.80	6.107E+00
8	14.29	8.390E+00	22	42.86	7.789E+00	34	67.35	5.270E+00	46	91.84	6.079E+00
9	16.33	8.371E+00	23	44.90	7.633E+00	35	69.39	5.288E+00	47	93.88	6.060E+00
10	18.37	8.352E+00	24	46.94	7.400E+00	36	71.43	5.359E+00	48	95.92	6.047E+00

11	20.41	8.330E+00	25	48.98	7.051E+00	37	73.47	5.503E+00	49	97.96	6.031E+00
12	22.45	8.307E+00	26	51.02	6.539E+00	38	75.51	5.743E+00	50	100.00	6.002E+00
13	24.49	8.282E+00									
14	26.53	8.253E+00									

********** CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 5, 1973

.... CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.602E-03	15	28.57	1.500E-02	27	53.06	2.338E-01	39	77.55	1.150E+00
2	2.04	4.737E-03	16	30.61	1.621E-02	28	55.10	2.966E-01	40	79.59	1.329E+00
3	4.08	5.006E-03	17	32.65	1.758E-02	29	57.14	3.707E-01	41	81.63	1.573E+00
4	6.12	5.404E-03	18	34.69	1.927E-02	30	59.18	4.582E-01	42	83.67	1.849E+00
5	8.16	5.921E-03	19	36.73	2.155E-02	31	61.22	5.618E-01	43	85.71	2.159E+00
6	10.20	6.546E-03	20	38.78	2.491E-02	32	63.26	6.854E-01	44	87.75	2.505E+00
7	12.24	7.265E-03	21	40.82	3.018E-02	33	65.31	8.345E-01	45	89.80	2.889E+00
8	14.29	8.065E-03	22	42.86	3.875E-02	34	67.35	1.015E+00	46	91.84	3.311E+00
9	16.33	8.931E-03	23	44.90	5.282E-02	35	69.39	1.232E+00	47	93.88	3.772E+00
10	18.37	9.850E-03	24	46.94	7.573E-02	36	71.43	1.491E+00	48	95.92	4.271E+00
11	20.41	1.081E-02	25	48.98	1.125E-01	37	73.47	1.796E+00	49	97.96	4.806E+00
12	22.45	1.180E-02	26	51.02	1.703E-01	38	75.51	2.152E+00	50	100.00	5.375E+00
13	24.49	1.283E-02									
14	26.53	1.389E-02									

.... NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.369E-02	15	28.57	1.419E-01	27	53.06	8.794E-01	39	77.55	2.296E+00
2	2.04	4.497E-02	16	30.61	1.525E-01	28	55.10	1.013E+00	40	79.59	2.505E+00
3	4.08	4.754E-02	17	32.65	1.640E-01	29	57.14	1.158E+00	41	81.63	2.767E+00
4	6.12	5.132E-02	18	34.69	1.768E-01	30	59.18	1.317E+00	42	83.67	3.043E+00
5	8.16	5.625E-02	19	36.73	1.922E-01	31	61.22	1.489E+00	43	85.71	3.331E+00
6	10.20	6.220E-02	20	38.78	2.121E-01	32	63.26	1.676E+00	44	87.75	3.632E+00
7	12.24	6.905E-02	21	40.82	2.399E-01	33	65.31	1.880E+00	45	89.80	3.944E+00
8	14.29	7.667E-02	22	42.86	2.805E-01	34	67.35	2.106E+00	46	91.84	4.266E+00
9	16.33	8.491E-02	23	44.90	3.409E-01	35	69.39	2.357E+00	47	93.88	4.599E+00
10	18.37	9.364E-02	24	46.94	4.297E-01	36	71.43	2.634E+00	48	95.92	4.938E+00
11	20.41	1.028E-01	25	48.98	5.557E-01	37	73.47	2.938E+00	49	97.96	5.284E+00
12	22.45	1.122E-01	26	51.02	7.251E-01	38	75.51	3.267E+00	50	100.00	5.634E+00
13	24.49	1.218E-01									
14	26.53	1.317E-01									

.... DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.487E+00	15	28.57	8.231E+00	27	53.06	6.095E+00	39	77.55	6.356E+00
2	2.04	8.483E+00	16	30.61	8.197E+00	28	55.10	5.900E+00	40	79.59	6.405E+00
3	4.08	8.475E+00	17	32.65	8.158E+00	29	57.14	5.730E+00	41	81.63	6.339E+00
4	6.12	8.464E+00	18	34.69	8.113E+00	30	59.18	5.581E+00	42	83.67	6.260E+00
5	8.16	8.451E+00	19	36.73	8.059E+00	31	61.22	5.456E+00	43	85.71	6.195E+00
6	10.20	8.437E+00	20	38.78	7.993E+00	32	63.26	5.359E+00	44	87.75	6.144E+00
7	12.24	8.420E+00	21	40.82	7.906E+00	33	65.31	5.292E+00	45	89.80	6.105E+00
8	14.29	8.402E+00	22	42.86	7.786E+00	34	67.35	5.259E+00	46	91.84	6.078E+00
9	16.33	8.383E+00	23	44.90	7.614E+00	35	69.39	5.268E+00	47	93.88	6.060E+00
10	18.37	8.362E+00	24	46.94	7.364E+00	36	71.43	5.332E+00	48	95.92	6.047E+00
11	20.41	8.340E+00	25	48.98	7.002E+00	37	73.47	5.472E+00	49	97.96	6.031E+00
12	22.45	8.316E+00	26	51.02	6.483E+00	38	75.51	5.712E+00	50	100.00	6.002E+00

13	[illegible]	8.291E+00
14	26.53	8.262E+00

DEPTH OR VELOCITY DEPENDENT VARIABLES,
BASED ON FLOWS FOR THE PERIOD JAN. 6, 1973 THRU JAN. 10, 1973

CROSSECTIONAL AREAS OF CHANNELS (SQFT

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	5.624E+04	38	76.53	3.776E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	5.481E+04	39	78.57	3.638E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	5.339E+04	40	80.61	3.501E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	5.197E+04	41	82.65	3.364E+04
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	5.054E+04	42	84.69	3.227E+04
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	4.912E+04	43	86.73	3.089E+04
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	4.770E+04	44	88.77	2.952E+04
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	4.627E+04	45	90.82	2.815E+04
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	4.485E+04	46	92.86	2.678E+04
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	4.343E+04	47	94.90	2.540E+04
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	4.200E+04	48	96.94	2.403E+04
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	4.058E+04	49	98.98	2.266E+04
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	1.125E+01	38	76.53	7.551E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	1.096E+01	39	78.57	7.277E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	1.068E+01	40	80.61	7.002E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	1.039E+01	41	82.65	6.728E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	1.011E+01	42	84.69	6.453E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	9.824E+00	43	86.73	6.179E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	9.539E+00	44	88.77	5.904E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	9.255E+00	45	90.82	5.630E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	8.970E+00	46	92.86	5.355E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	8.685E+00	47	94.90	5.081E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	8.400E+00	48	96.94	4.806E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	8.116E+00	49	98.98	4.532E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	1.511E-01	38	76.53	2.119E-01
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	1.551E-01	39	78.57	2.199E-01
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	1.592E-01	40	80.61	2.285E-01
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	1.636E-01	41	82.65	2.378E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	1.682E-01	42	84.69	2.479E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	1.730E-01	43	86.73	2.590E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	1.782E-01	44	88.77	2.710E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	1.837E-01	45	90.82	2.842E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	1.895E-01	46	92.86	2.988E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	1.957E-01	47	94.90	3.149E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	2.024E-01	48	96.94	3.329E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	2.095E-01	49	98.98	3.531E-01
13	25.51	1.500E+00									

********** JUNCTION VOLUMES (CUFT) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09	15	28.57	1.156E+09	27	53.06	5.989E+08	39	77.55	3.998E+08
2	2.04	1.585E+09	16	30.61	1.123E+09	28	55.10	5.835E+08	40	79.59	3.850E+08
3	4.08	1.552E+09	17	32.65	1.090E+09	29	57.14	5.682E+08	41	81.63	3.702E+08
4	6.12	1.519E+09	18	34.69	1.057E+09	30	59.18	5.528E+08	42	83.67	3.554E+08
5	8.16	1.486E+09	19	36.73	1.024E+09	31	61.22	5.375E+08	43	85.71	3.406E+08
6	10.20	1.453E+09	20	38.78	9.905E+08	32	63.26	5.221E+08	44	87.75	3.258E+08
7	12.24	1.420E+09	21	40.82	9.575E+08	33	65.31	5.068E+08	45	89.80	3.110E+08
8	14.29	1.387E+09	22	42.86	9.245E+08	34	67.35	4.914E+08	46	91.84	2.962E+08
9	16.33	1.354E+09	23	44.90	8.915E+08	35	69.39	4.761E+08	47	93.88	2.814E+08
10	18.37	1.321E+09	24	46.94	8.585E+08	36	71.43	4.607E+08	48	95.92	2.666E+08
11	20.41	1.288E+09	25	48.98	8.254E+08	37	73.47	4.453E+08	49	97.96	2.518E+08
12	22.45	1.255E+09	26	51.02	7.077E+08	38	75.51	4.225E+08	50	100.00	2.444E+08
13	24.49	1.222E+09									
14	26.53	1.189E+09									

********** COMPUTED REAERATION RATES (1/DAY) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01	15	28.57	3.062E-01	27	53.06	1.536E-01	39	77.55	3.346E-01
2	2.04	3.062E-01	16	30.61	3.062E-01	28	55.10	1.618E-01	40	79.59	3.608E-01
3	4.08	3.062E-01	17	32.65	3.062E-01	29	57.14	1.707E-01	41	81.63	3.903E-01
4	6.12	3.062E-01	18	34.69	3.062E-01	30	59.18	1.803E-01	42	83.67	4.235E-01
5	8.16	3.062E-01	19	36.73	3.062E-01	31	61.22	1.908E-01	43	85.71	4.612E-01
6	10.20	3.062E-01	20	38.78	3.062E-01	32	63.26	2.022E-01	44	87.75	5.041E-01
7	12.24	3.062E-01	21	40.82	3.062E-01	33	65.31	2.146E-01	45	89.80	5.533E-01
8	14.29	3.062E-01	22	42.86	3.062E-01	34	67.35	2.282E-01	46	91.84	6.102E-01
9	16.33	3.062E-01	23	44.90	3.062E-01	35	69.39	2.432E-01	47	93.88	6.762E-01
10	18.37	3.062E-01	24	46.94	3.062E-01	36	71.43	2.597E-01	48	95.92	7.535E-01
11	20.41	3.062E-01	25	48.98	3.062E-01	37	73.47	2.779E-01	49	97.96	8.450E-01
12	22.45	3.062E-01	26	51.02	2.279E-01	38	75.51	3.048E-01	50	100.00	8.946E-01
13	24.49	3.062E-01									
14	26.53	3.062E-01									

FLOW CONDITIONS FOR JAN. 6, 1973 THRU JAN. 10, 1973

NUMBER OF DAYS IN THIS PERIOD = 5
TOTAL INFLOWS = 8500.00 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 8500.00 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	8.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-8.500E+03	14	27.55	-8.500E+03	26	52.04	-8.500E+03	38	76.53	-8.000E+03
2	3.06	-8.500E+03	15	29.59	-8.500E+03	27	54.08	-8.500E+03	39	78.57	-8.000E+03
3	5.10	-8.500E+03	16	31.63	-8.500E+03	28	56.12	-8.500E+03	40	80.61	-8.000E+03
4	7.14	-8.500E+03	17	33.67	-8.500E+03	29	58.16	-8.500E+03	41	82.65	-8.000E+03
5	9.18	-8.500E+03	18	35.71	-8.500E+03	30	60.20	-8.500E+03	42	84.69	-8.000E+03
6	11.22	-8.500E+03	19	37.75	-8.500E+03	31	62.24	-8.500E+03	43	86.73	-8.000E+03
7	13.27	-8.500E+03	20	39.80	-8.500E+03	32	64.29	-8.500E+03	44	88.77	-8.000E+03
8	15.31	-8.500E+03	21	41.84	-8.500E+03	33	66.33	-8.500E+03	45	90.82	-8.000E+03

9	17.35	-8.500E+03	22	43.88	-8.500E+03	34	68.37	-8.500E+03	46	92.86	-8.000E+03
10	19.39	-8.500E+03	23	45.92	-8.500E+03	35	70.41	-8.500E+03	47	94.90	-8.000E+03
11	21.43	-8.500E+03	24	47.96	-8.500E+03	36	72.45	-8.500E+03	48	96.94	-8.000E+03
12	23.47	-8.500E+03	25	50.00	-8.500E+03	37	74.49	-8.500E+03	49	98.98	-8.000E+03
13	25.51	-8.500E+03									

TDS INPUT CONCENTRATIONS FOR JAN. 6, 1973 THRU JAN. 10, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS
JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 1.5000E+04 (PPM)

AUTOQUAL - TEST PROBLEM

TDS CONCENTRATIONS FOR THE PERIOD JAN. 6, 1973 THRU JAN. 10, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

TDS CONCENTRATIONS (PPM) ON JAN. 6, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+04	15	28.57	2.925E+03	27	53.06	9.755E-02	39	77.55	4.079E-18
2	2.04	1.455E+04	16	30.61	2.284E+03	28	55.10	7.887E-03	40	79.59	8.218E-20
3	4.08	1.401E+04	17	32.65	1.728E+03	29	57.14	5.974E-04	41	81.63	1.490E-21
4	6.12	1.332E+04	18	34.69	1.259E+03	30	59.18	4.092E-05	42	83.67	2.435E-23
5	8.16	1.247E+04	19	36.73	8.764E+02	31	61.22	2.472E-06	43	85.71	3.597E-25
6	10.20	1.148E+04	20	38.78	5.760E+02	32	63.26	1.304E-07	44	87.75	4.808E-27
7	12.24	1.043E+04	21	40.82	3.519E+02	33	65.31	5.991E-09	45	89.80	5.822E-29
8	14.29	9.348E+03	22	42.86	1.950E+02	34	67.35	2.407E-10	46	91.84	6.392E-31
9	16.33	8.279E+03	23	44.90	9.435E+01	35	69.39	8.498E-12	47	93.88	6.365E-33
10	18.37	7.244E+03	24	46.94	3.716E+01	36	71.43	2.649E-13	48	95.92	5.747E-35
11	20.41	6.254E+03	25	48.98	1.023E+01	37	73.47	7.328E-15	49	97.96	4.703E-37
12	22.45	5.320E+03	26	51.02	1.164E+00	38	75.51	1.816E-16	50	100.00	3.445E-39
13	24.49	4.449E+03									
14	26.53	3.648E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 7, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+04	15	28.57	2.789E+03	27	53.06	6.746E-02	39	77.55	6.878E-18
2	2.04	1.426E+04	16	30.61	2.166E+03	28	55.10	5.299E-03	40	79.59	1.573E-19
3	4.08	1.352E+04	17	32.65	1.629E+03	29	57.14	3.988E-04	41	81.63	3.240E-21
4	6.12	1.274E+04	18	34.69	1.178E+03	30	59.18	2.792E-05	42	83.67	6.023E-23
5	8.16	1.189E+04	19	36.73	8.123E+02	31	61.22	1.774E-06	43	85.71	1.012E-24
6	10.20	1.098E+04	20	38.78	5.276E+02	32	63.26	1.007E-07	44	87.75	1.540E-26
7	12.24	1.001E+04	21	40.82	3.175E+02	33	65.31	5.062E-09	45	89.80	2.122E-28
8	14.29	9.012E+03	22	42.86	1.725E+02	34	67.35	2.251E-10	46	91.84	2.650E-30
9	16.33	8.001E+03	23	44.90	8.125E+01	35	69.39	8.866E-12	47	93.88	3.000E-32
10	18.37	7.004E+03	24	46.94	3.085E+01	36	71.43	3.101E-13	48	95.92	3.076E-34
11	20.41	6.041E+03	25	48.98	8.065E+00	37	73.47	9.663E-15	49	97.96	2.855E-36
12	22.45	5.127E+03	26	51.02	8.465E-01	38	75.51	2.701E-16	50	100.00	2.375E-38
13	24.49	4.275E+03									
14	26.53	3.494E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 8, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+04	15	28.57	2.660E+03	27	53.06	4.890E-02	39	77.55	9.094E-18
2	2.04	1.411E+04	16	30.61	2.057E+03	28	55.10	3.678E-03	40	79.59	2.308E-19
3	4.08	1.325E+04	17	32.65	1.538E+03	29	57.14	2.703E-04	41	81.63	5.278E-21
4	6.12	1.238E+04	18	34.69	1.104E+03	30	59.18	1.891E-05	42	83.67	1.090E-22
5	8.16	1.149E+04	19	36.73	7.548E+02	31	61.22	1.230E-06	43	85.71	2.036E-24
6	10.20	1.058E+04	20	38.78	4.851E+02	32	63.26	7.293E-08	44	87.75	3.443E-26

7	12.24	9.636E+03	21	40.82	2.880E+02	33	65.31	3.899E-09	45	89.80	5.274E-28
8	14.29	8.674E+03	22	42.86	1.538E+02	34	67.35	1.867E-10	46	91.84	7.318E-30
9	16.33	7.707E+03	23	44.90	7.086E+01	35	69.39	7.990E-12	47	93.88	9.197E-32
10	18.37	6.750E+03	24	46.94	2.613E+01	36	71.43	3.057E-13	48	95.92	1.046E-33
11	20.41	5.821E+03	25	48.98	6.567E+00	37	73.47	1.047E-14	49	97.96	1.076E-35
12	22.45	4.935E+03	26	51.02	6.486E-01	38	75.51	3.223E-16	50	100.00	9.924E-38
13	24.49	4.107E+03									
14	26.53	3.346E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 9, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+04	15	28.57	2.539E+03	27	53.06	3.717E-02	39	77.55	1.005E-17
2	2.04	1.401E+04	16	30.61	1.954E+03	28	55.10	2.663E-03	40	79.59	2.779E-19
3	4.08	1.305E+04	17	32.65	1.453E+03	29	57.14	1.886E-04	41	81.63	6.933E-21
4	6.12	1.212E+04	18	34.69	1.037E+03	30	59.18	1.295E-05	42	83.67	1.563E-22
5	8.16	1.119E+04	19	36.73	7.034E+02	31	61.22	8.436E-07	43	85.71	3.189E-24
6	10.20	1.025E+04	20	38.78	4.477E+02	32	63.26	5.111E-08	44	87.75	5.889E-26
7	12.24	9.312E+03	21	40.82	2.627E+02	33	65.31	2.838E-09	45	89.80	9.849E-28
8	14.29	8.368E+03	22	42.86	1.383E+02	34	67.35	1.431E-10	46	91.84	1.492E-29
9	16.33	7.426E+03	23	44.90	6.253E+01	35	69.39	6.512E-12	47	93.88	2.045E-31
10	18.37	6.500E+03	24	46.94	2.253E+01	36	71.43	2.670E-13	48	95.92	2.536E-33
11	20.41	5.601E+03	25	48.98	5.491E+00	37	73.47	9.855E-15	49	97.96	2.840E-35
12	22.45	4.744E+03	26	51.02	5.181E-01	38	75.51	3.277E-16	50	100.00	2.852E-37
13	24.49	3.941E+03									
14	26.53	3.203E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 10, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.500E+04	15	28.57	2.423E+03	27	53.06	2.947E-02	39	77.55	9.718E-18
2	2.04	1.393E+04	16	30.61	1.858E+03	28	55.10	2.017E-03	40	79.59	2.882E-19
3	4.08	1.290E+04	17	32.65	1.375E+03	29	57.14	1.368E-04	41	81.63	7.729E-21
4	6.12	1.191E+04	18	34.69	9.759E+02	30	59.18	9.098E-06	42	83.67	1.875E-22
5	8.16	1.094E+04	19	36.73	6.573E+02	31	61.22	5.835E-07	43	85.71	4.119E-24
6	10.20	9.983E+03	20	38.78	4.149E+02	32	63.26	3.543E-08	44	87.75	8.192E-26
7	12.24	9.034E+03	21	40.82	2.409E+02	33	65.31	2.004E-09	45	89.80	1.476E-27
8	14.29	8.095E+03	22	42.86	1.252E+02	34	67.35	1.043E-10	46	91.84	2.406E-29
9	16.33	7.169E+03	23	44.90	5.578E+01	35	69.39	4.959E-12	47	93.88	3.550E-31
10	18.37	6.264E+03	24	46.94	1.971E+01	36	71.43	2.141E-13	48	95.92	4.732E-33
11	20.41	5.390E+03	25	48.98	4.692E+00	37	73.47	8.372E-15	49	97.96	5.692E-35
12	22.45	4.559E+03	26	51.02	4.275E-01	38	75.51	2.961E-16	50	100.00	6.139E-37
13	24.49	3.780E+03									
14	26.53	3.066E+03									

CBOD, NBOD AND DO INPUT CONC. FOR JAN. 6, 1973 THRU JAN. 10, 1973

CBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

NBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

DO INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0

12	22.45	0.0		26	51.02	0.0		38	75.51	2.000E+00	50	100.00	6.000E+00			
13	24.49	0.0														
14	26.53	0.0														

AUTOQD - TEST PROBLEM

CBOD, NBOD AND DO CONC FOR THE PERIOD JAN. 6, 1973 THRU JAN. 10, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 6, 1973

CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.857E-03	15	28.57	1.186E-02	27	53.06	2.412E-01	39	77.55	1.190E+00
2	2.04	3.956E-03	16	30.61	1.299E-02	28	55.10	3.031E-01	40	79.59	1.382E+00
3	4.08	4.152E-03	17	32.65	1.442E-02	29	57.14	3.766E-01	41	81.63	1.633E+00
4	6.12	4.441E-03	18	34.69	1.636E-02	30	59.18	4.650E-01	42	83.67	1.917E+00
5	8.16	4.816E-03	19	36.73	1.917E-02	31	61.22	5.719E-01	43	85.71	2.238E+00
6	10.20	5.269E-03	20	38.78	2.347E-02	32	63.26	7.017E-01	44	87.75	2.596E+00
7	12.24	5.794E-03	21	40.82	3.024E-02	33	65.31	8.586E-01	45	89.80	2.992E+00
8	14.29	6.381E-03	22	42.86	4.102E-02	34	67.35	1.044E+00	46	91.84	3.426E+00
9	16.33	7.021E-03	23	44.90	5.811E-02	35	69.39	1.255E+00	47	93.88	3.895E+00
10	18.37	7.707E-03	24	46.94	8.472E-02	36	71.43	1.480E+00	48	95.92	4.391E+00
11	20.41	8.434E-03	25	48.98	1.247E-01	37	73.47	1.708E+00	49	97.96	4.906E+00
12	22.45	9.200E-03	26	51.02	1.817E-01	38	75.51	1.957E+00	50	100.00	5.434E+00
13	24.49	1.001E-02									
14	26.53	1.088E-02									

NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.164E-02	15	28.57	1.260E-01	27	53.06	8.977E-01	39	77.55	2.348E+00
2	2.04	4.271E-02	16	30.61	1.362E-01	28	55.10	1.030E+00	40	79.59	2.568E+00
3	4.08	4.484E-02	17	32.65	1.480E-01	29	57.14	1.174E+00	41	81.63	2.831E+00
4	6.12	4.796E-02	18	34.69	1.621E-01	30	59.18	1.332E+00	42	83.67	3.109E+00
5	8.16	5.202E-02	19	36.73	1.803E-01	31	61.22	1.505E+00	43	85.71	3.401E+00
6	10.20	5.694E-02	20	38.78	2.049E-01	32	63.26	1.697E+00	44	87.75	3.706E+00
7	12.24	6.261E-02	21	40.82	2.398E-01	33	65.31	1.909E+00	45	89.80	4.022E+00
8	14.29	6.896E-02	22	42.86	2.900E-01	34	67.35	2.140E+00	46	91.84	4.349E+00
9	16.33	7.587E-02	23	44.90	3.616E-01	35	69.39	2.385E+00	47	93.88	4.683E+00
10	18.37	8.326E-02	24	46.94	4.612E-01	36	71.43	2.627E+00	48	95.92	5.017E+00
11	20.41	9.104E-02	25	48.98	5.927E-01	37	73.47	2.854E+00	49	97.96	5.347E+00
12	22.45	9.918E-02	26	51.02	7.542E-01	38	75.51	3.084E+00	50	100.00	5.670E+00
13	24.49	1.077E-01									
14	26.53	1.165E-01									

DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.498E+00	15	28.57	8.238E+00	27	53.06	5.975E+00	39	77.55	6.206E+00
2	2.04	8.494E+00	16	30.61	8.204E+00	28	55.10	5.784E+00	40	79.59	6.221E+00
3	4.08	8.486E+00	17	32.65	8.164E+00	29	57.14	5.620E+00	41	81.63	6.141E+00
4	6.12	8.475E+00	18	34.69	8.117E+00	30	59.18	5.475E+00	42	83.67	6.051E+00

5	8.16	8.461E+00	19	36.73	8.058E+00	31	61.22	5.352E+00	43	85.71	5.972E+00
6	10.20	8.446E+00	20	38.78	7.983E+00	32	63.26	5.253E+00	44	87.75	5.905E+00
7	12.24	8.429E+00	21	40.82	7.882E+00	33	65.31	5.181E+00	45	89.80	5.850E+00
8	14.29	8.411E+00	22	42.86	7.741E+00	34	67.35	5.147E+00	46	91.84	5.809E+00
9	16.33	8.391E+00	23	44.90	7.542E+00	35	69.39	5.165E+00	47	93.88	5.785E+00
10	18.37	8.370E+00	24	46.94	7.259E+00	36	71.43	5.257E+00	48	95.92	5.787E+00
11	20.41	8.348E+00	25	48.98	6.869E+00	37	73.47	5.436E+00	49	97.96	5.819E+00
12	22.45	8.323E+00	26	51.02	6.350E+00	38	75.51	5.692E+00	50	100.00	5.877E+00
13	24.49	8.297E+00									
14	26.53	8.269E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 7, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.187E-03	15	28.57	9.629E-03	27	53.06	2.465E-01	39	77.55	1.232E+00
2	2.04	3.259E-03	16	30.61	1.082E-02	28	55.10	3.085E-01	40	79.59	1.434E+00
3	4.08	3.402E-03	17	32.65	1.244E-02	29	57.14	3.835E-01	41	81.63	1.692E+00
4	6.12	3.612E-03	18	34.69	1.477E-02	30	59.18	4.747E-01	42	83.67	1.985E+00
5	8.16	3.887E-03	19	36.73	1.824E-02	31	61.22	5.851E-01	43	85.71	2.314E+00
6	10.20	4.220E-03	20	38.78	2.356E-02	32	63.26	7.162E-01	44	87.75	2.677E+00
7	12.24	4.607E-03	21	40.82	3.179E-02	33	65.31	8.677E-01	45	89.80	3.072E+00
8	14.29	5.043E-03	22	42.86	4.445E-02	34	67.35	1.037E+00	46	91.84	3.496E+00
9	16.33	5.524E-03	23	44.90	6.365E-02	35	69.39	1.222E+00	47	93.88	3.946E+00
10	18.37	6.047E-03	24	46.94	9.200E-02	36	71.43	1.429E+00	48	95.92	4.420E+00
11	20.41	6.614E-03	25	48.98	1.325E-01	37	73.47	1.671E+00	49	97.96	4.917E+00
12	22.45	7.230E-03	26	51.02	1.881E-01	38	75.51	1.963E+00	50	100.00	5.437E+00
13	24.49	7.912E-03									
14	26.53	8.693E-03									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.913E-02	15	28.57	1.132E-01	27	53.06	9.124E-01	39	77.55	2.400E+00
2	2.04	4.002E-02	16	30.61	1.237E-01	28	55.10	1.044E+00	40	79.59	2.625E+00
3	4.08	4.178E-02	17	32.65	1.365E-01	29	57.14	1.189E+00	41	81.63	2.891E+00
4	6.12	4.437E-02	18	34.69	1.528E-01	30	59.18	1.348E+00	42	83.67	3.172E+00
5	8.16	4.774E-02	19	36.73	1.745E-01	31	61.22	1.525E+00	43	85.71	3.466E+00
6	10.20	5.183E-02	20	38.78	2.043E-01	32	63.26	1.717E+00	44	87.75	3.772E+00
7	12.24	5.658E-02	21	40.82	2.459E-01	33	65.31	1.923E+00	45	89.80	4.085E+00
8	14.29	6.191E-02	22	42.86	3.038E-01	34	67.35	2.136E+00	46	91.84	4.402E+00
9	16.33	6.777E-02	23	44.90	3.828E-01	35	69.39	2.352E+00	47	93.88	4.720E+00
10	18.37	7.409E-02	24	46.94	4.869E-01	36	71.43	2.575E+00	48	95.92	5.038E+00
11	20.41	8.084E-02	25	48.98	6.174E-01	37	73.47	2.819E+00	49	97.96	5.355E+00
12	22.45	8.801E-02	26	51.02	7.728E-01	38	75.51	3.097E+00	50	100.00	5.672E+00
13	24.49	9.567E-02									
14	26.53	1.040E-01									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.506E+00	15	28.57	8.245E+00	27	53.06	5.873E+00	39	77.55	6.054E+00
2	2.04	8.502E+00	16	30.61	8.209E+00	28	55.10	5.688E+00	40	79.59	6.058E+00
3	4.08	8.494E+00	17	32.65	8.167E+00	29	57.14	5.526E+00	41	81.63	5.970E+00
4	6.12	8.483E+00	18	34.69	8.116E+00	30	59.18	5.382E+00	42	83.67	5.875E+00
5	8.16	8.469E+00	19	36.73	8.051E+00	31	61.22	5.257E+00	43	85.71	5.793E+00
6	10.20	8.454E+00	20	38.78	7.966E+00	32	63.26	5.158E+00	44	87.75	5.731E+00

7	12.24	8.417E+00	21	40.82	7.850E+00	33	65.31	5.096E+00	45	89.80	5.692E+00
8	14.29	8.414E+00	22	42.86	7.690E+00	34	67.35	5.081E+00	46	91.84	5.681E+00
9	16.33	8.399E+00	23	44.90	7.469E+00	35	69.39	5.125E+00	47	93.88	5.698E+00
10	18.37	8.378E+00	24	46.94	7.168E+00	36	71.43	5.229E+00	48	95.92	5.741E+00
11	20.41	8.355E+00	25	48.98	6.767E+00	37	73.47	5.383E+00	49	97.96	5.802E+00
12	22.45	8.331E+00	26	51.02	6.245E+00	38	75.51	5.587E+00	50	100.00	5.873E+00
13	24.49	8.305E+00									
14	26.53	8.277E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 8, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.604E-03	15	28.57	8.145E-03	27	53.06	2.513E-01	39	77.55	1.275E+00
2	2.04	2.657E-03	16	30.61	9.482E-03	28	55.10	3.145E-01	40	79.59	1.483E+00
3	4.08	2.762E-03	17	32.65	1.138E-02	29	57.14	3.909E-01	41	81.63	1.746E+00
4	6.12	2.917E-03	18	34.69	1.416E-02	30	59.18	4.826E-01	42	83.67	2.041E+00
5	8.16	3.120E-03	19	36.73	1.831E-02	31	61.22	5.905E-01	43	85.71	2.366E+00
6	10.20	3.368E-03	20	38.78	2.456E-02	32	63.26	7.145E-01	44	87.75	2.721E+00
7	12.24	3.659E-03	21	40.82	3.394E-02	33	65.31	8.553E-01	45	89.80	3.105E+00
8	14.29	3.990E-03	22	42.86	4.787E-02	34	67.35	1.015E+00	46	91.84	3.517E+00
9	16.33	4.362E-03	23	44.90	6.818E-02	35	69.39	1.201E+00	47	93.88	3.956E+00
10	18.37	4.777E-03	24	46.94	9.713E-02	36	71.43	1.422E+00	48	95.92	4.424E+00
11	20.41	5.242E-03	25	48.98	1.374E-01	37	73.47	1.685E+00	49	97.96	4.918E+00
12	22.45	5.772E-03	26	51.02	1.926E-01	38	75.51	1.99JE+00	50	100.00	5.437E+00
13	24.49	6.395E-03									
14	26.53	7.159E-03									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.636E-02	15	28.57	1.034E-01	27	53.06	9.250E-01	39	77.55	2.449E+00
2	2.04	3.710E-02	16	30.61	1.149E-01	28	55.10	1.058E+00	40	79.59	2.677E+00
3	4.08	3.857E-02	17	32.65	1.293E-01	29	57.14	1.203E+00	41	81.63	2.944E+00
4	6.12	4.073E-02	18	34.69	1.481E-01	30	59.18	1.363E+00	42	83.67	3.224E+00
5	8.16	4.355E-02	19	36.73	1.735E-01	31	61.22	1.535E+00	43	85.71	3.514E+00
6	10.20	4.699E-02	20	38.78	2.080E-01	32	63.26	1.719E+00	44	87.75	3.811E+00
7	12.24	5.101E-02	21	40.82	2.550E-01	33	65.31	1.911E+00	45	89.80	4.113E+00
8	14.29	5.555E-02	22	42.86	3.182E-01	34	67.35	2.113E+00	46	91.84	4.419E+00
9	16.33	6.058E-02	23	44.90	4.010E-01	35	69.39	2.330E+00	47	93.88	4.728E+00
10	18.37	6.610E-02	24	46.94	5.061E-01	36	71.43	2.571E+00	48	95.92	5.041E+00
11	20.41	7.209E-02	25	48.98	6.345E-01	37	73.47	2.840E+00	49	97.96	5.356E+00
12	22.45	7.863E-02	26	51.02	7.865E-01	38	75.51	3.136E+00	50	100.00	5.672E+00
13	24.49	8.584E-02									
14	26.53	9.396E-02									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.513E+00	15	28.57	8.251E+00	27	53.06	5.787E+00	39	77.55	5.920E+00
2	2.04	8.509E+00	16	30.61	8.213E+00	28	55.10	5.604E+00	40	79.59	5.921E+00
3	4.08	8.500E+00	17	32.65	8.167E+00	29	57.14	5.443E+00	41	81.63	5.836E+00
4	6.12	8.489E+00	18	34.69	8.111E+00	30	59.18	5.301E+00	42	83.67	5.751E+00
5	8.16	8.476E+00	19	36.73	8.038E+00	31	61.22	5.184E+00	43	85.71	5.687E+00
6	10.20	8.461E+00	20	38.78	7.942E+00	32	63.26	5.098E+00	44	87.75	5.649E+00
7	12.24	8.444E+00	21	40.82	7.814E+00	33	65.31	5.053E+00	45	89.80	5.637E+00
8	14.29	8.425E+00	22	42.86	7.640E+00	34	67.35	5.052E+00	46	91.84	5.650E+00

9	16.33	8.408E+00	23	44.90	7.405E+00	35	69.39	5.091E+00	47	93.88	5.685E+00
10	18.37	8.385E+00	24	46.94	7.094E+00	36	71.43	5.169E+00	48	95.92	5.737E+00
11	20.41	8.362E+00	25	48.98	6.686E+00	37	73.47	5.290E+00	49	97.96	5.801E+00
12	22.45	8.338E+00	26	51.02	6.160E+00	38	75.51	5.470E+00	50	100.00	5.873E+00
13	24.49	8.312E+00									
14	26.53	8.283E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 9, 1973

••••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.111E-03	15	28.57	7.241E-03	27	53.06	2.558E-01	39	77.55	1.312E+00
2	2.04	2.150E-03	16	30.61	8.771E-03	28	55.10	3.193E-01	40	79.59	1.521E+00
3	4.08	2.229E-03	17	32.65	1.097E-02	29	57.14	3.947E-01	41	81.63	1.782E+00
4	6.12	2.345E-03	18	34.69	1.419E-02	30	59.18	4.833E-01	42	83.67	2.072E+00
5	8.16	2.498E-03	19	36.73	1.893E-02	31	61.22	5.863E-01	43	85.71	2.390E+00
6	10.20	2.687E-03	20	38.78	2.590E-02	32	63.26	7.056E-01	44	87.75	2.737E+00
7	12.24	2.912E-03	21	40.82	3.607E-02	33	65.31	8.447E-01	45	89.80	3.113E+00
8	14.29	3.173E-03	22	42.86	5.074E-02	34	67.35	1.009E+00	46	91.84	3.520E+00
9	16.33	3.474E-03	23	44.90	7.159E-02	35	69.39	1.205E+00	47	93.88	3.957E+00
10	18.37	3.823E-03	24	46.94	1.008E-01	36	71.43	1.438E+00	48	95.92	4.424E+00
11	20.41	4.233E-03	25	48.98	1.412E-01	37	73.47	1.710E+00	49	97.96	4.918E+00
12	22.45	4.728E-03	26	51.02	1.966E-01	38	75.51	2.025E+00	50	100.00	5.437E+00
13	24.49	5.346E-03									
14	26.53	6.150E-03									

••••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.330E-02	15	28.57	9.648E-02	27	53.06	9.362E-01	39	77.55	2.493E+00
2	2.04	3.412E-02	16	30.61	1.091E-01	28	55.10	1.068E+00	40	79.59	2.719E+00
3	4.08	3.596E-02	17	32.65	1.254E-01	29	57.14	1.212E+00	41	81.63	2.982E+00
4	6.12	3.719E-02	18	34.69	1.469E-01	30	59.18	1.367E+00	42	83.67	3.255E+00
5	8.16	3.957E-02	19	36.73	1.755E-01	31	61.22	1.533E+00	43	85.71	3.537E+00
6	10.20	4.259E-02	20	38.78	2.138E-01	32	63.26	1.709E+00	44	87.75	3.826E+00
7	12.24	4.559E-02	21	40.82	2.646E-01	33	65.31	1.899E+00	45	89.80	4.121E+00
8	14.29	4.969E-02	22	42.86	3.310E-01	34	67.35	2.107E+00	46	91.84	4.423E+00
9	16.33	5.432E-02	23	44.90	4.155E-01	35	69.39	2.337E+00	47	93.88	4.730E+00
10	18.37	5.926E-02	24	46.94	5.205E-01	36	71.43	2.593E+00	48	95.92	5.041E+00
11	20.41	6.477E-02	25	48.98	6.474E-01	37	73.47	2.873E+00	49	97.96	5.356E+00
12	22.45	7.097E-02	26	51.02	7.979E-01	38	75.51	3.176E+00	50	100.00	5.672E+00
13	24.49	7.806E-02									
14	26.53	8.639E-02									

••••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.519E+00	15	28.57	8.254E+00	27	53.06	5.713E+00	39	77.55	5.813E+00
2	2.04	8.514E+00	16	30.61	8.213E+00	28	55.10	5.532E+00	40	79.59	5.824E+00
3	4.08	8.506E+00	17	32.65	8.164E+00	29	57.14	5.378E+00	41	81.63	5.754E+00
4	6.12	8.495E+00	18	34.69	8.102E+00	30	59.18	5.245E+00	42	83.67	5.687E+00
5	8.16	8.482E+00	19	36.73	8.022E+00	31	61.22	5.140E+00	43	85.71	5.643E+00
6	10.20	8.467E+00	20	38.78	7.918E+00	32	63.26	5.067E+00	44	87.75	5.623E+00
7	12.24	8.450E+00	21	40.82	7.779E+00	33	65.31	5.025E+00	45	89.80	5.625E+00
8	14.29	8.432E+00	22	42.86	7.595E+00	34	67.35	5.012E+00	46	91.84	5.645E+00
9	16.33	8.412E+00	23	44.90	7.351E+00	35	69.39	5.030E+00	47	93.88	5.683E+00
10	18.37	8.391E+00	24	46.94	7.033E+00	36	71.43	5.085E+00	48	95.92	5.736E+00

11	20.41	8.3[illegible]E+00	25	48.98	6.620E+00	37	73.47	5.191E+00	49	97.96	5.801E+00
12	22.45	8.1[illegible]E+00	26	51.02	6.088E+00	38	75.51	5.366E+00	50	100.00	5.873E+00
13	24.49	8.118E+00									
14	26.53	8.288E+00									

********** CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 10, 1973

********** CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.701E-03	15	28.57	6.762E-03	27	53.06	2.585E-01	39	77.55	1.338E+00
2	2.04	1.731E-03	16	30.61	8.494E-03	28	55.10	3.207E-01	40	79.59	1.543E+00
3	4.08	1.791E-03	17	32.65	1.098E-02	29	57.14	3.939E-01	41	81.63	1.800E+00
4	6.12	1.881E-03	18	34.69	1.457E-02	30	59.18	4.799E-01	42	83.67	2.084E+00
5	8.16	2.001E-03	19	36.73	1.977E-02	31	61.22	5.813E-01	43	85.71	2.397E+00
6	10.20	2.150E-03	20	38.78	2.724E-02	32	63.26	7.015E-01	44	87.75	2.741E+00
7	12.24	2.332E-03	21	40.82	3.791E-02	33	65.31	8.450E-01	45	89.80	3.115E+00
8	14.29	2.550E-03	22	42.86	5.301E-02	34	67.35	1.016E+00	46	91.84	3.521E+00
9	16.33	2.810E-03	23	44.90	7.418E-02	35	69.39	1.220E+00	47	93.88	3.958E+00
10	18.37	3.126E-03	24	46.94	1.036E-01	36	71.43	1.458E+00	48	95.92	4.424E+00
11	20.41	3.515E-03	25	48.98	1.441E-01	37	73.47	1.734E+00	49	97.96	4.918E+00
12	22.45	4.011E-03	26	51.02	1.996E-01	38	75.51	2.050E+00	50	100.00	5.437E+00
13	24.49	4.661E-03									
14	26.53	5.540E-03									

********** NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.0[illegible]E-02	15	28.57	9.193E-02	27	53.06	9.441E-01	39	77.55	2.524E+00
2	2.04	3.1[illegible]E-02	16	30.61	1.059E-01	28	55.10	1.074E+00	40	79.59	2.745E+00
3	4.08	3.2[illegible]E-02	17	32.65	1.240E-01	29	57.14	1.213E+00	41	81.63	3.002E+00
4	6.12	3.3[illegible]E-02	18	34.69	1.478E-01	30	59.18	1.364E+00	42	83.67	3.269E+00
5	8.16	3.[illegible]E-02	19	36.73	1.792E-01	31	61.22	1.527E+00	43	85.71	3.545E+00
6	10.20	3.[illegible]E-02	20	38.78	2.203E-01	32	63.26	1.705E+00	44	87.75	3.830E+00
7	12.24	4.1[illegible]E-02	21	40.82	2.736E-01	33	65.31	1.901E+00	45	89.80	4.123E+00
8	14.29	4.[illegible]E-02	22	42.86	3.417E-01	34	67.35	2.119E+00	46	91.84	4.423E+00
9	16.33	4.[illegible]E-02	23	44.90	4.270E-01	35	69.39	2.359E+00	47	93.88	4.730E+00
10	18.37	5.[illegible]E-02	24	46.94	5.316E-01	36	71.43	2.622E+00	48	95.92	5.041E+00
11	20.41	5.881E-02	25	48.98	6.576E-01	37	73.47	2.905E+00	49	97.96	5.356E+00
12	22.45	6.493E-02	26	51.02	8.071E-01	38	75.51	3.208E+00	50	100.00	5.672E+00
13	24.49	7.218E-02									
14	26.53	8.098E-02									

********** DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.523E+00	15	28.57	8.254E+00	27	53.06	5.652E+00	39	77.55	5.743E+00
2	2.04	8.519E+00	16	30.61	8.211E+00	28	55.10	5.479E+00	40	79.59	5.769E+00
3	4.08	8.511E+00	17	32.65	8.158E+00	29	57.14	5.334E+00	41	81.63	5.715E+00
4	6.12	8.500E+00	18	34.69	8.091E+00	30	59.18	5.211E+00	42	83.67	5.663E+00
5	8.16	8.487E+00	19	36.73	8.005E+00	31	61.22	5.112E+00	43	85.71	5.630E+00
6	10.20	8.472E+00	20	38.78	7.893E+00	32	63.26	5.036E+00	44	87.75	5.617E+00
7	12.24	8.455E+00	21	40.82	7.747E+00	33	65.31	4.983E+00	45	89.80	5.622E+00
8	14.29	8.437E+00	22	42.86	7.556E+00	34	67.35	4.954E+00	46	91.84	5.645E+00
9	16.33	8.418E+00	23	44.90	7.307E+00	35	69.39	4.956E+00	47	93.88	5.683E+00
10	18.37	8.397E+00	24	46.94	6.983E+00	36	71.43	5.002E+00	48	95.92	5.736E+00
11	20.41	8.374E+00	25	48.98	6.565E+00	37	73.47	5.107E+00	49	97.96	5.801E+00
12	22.45	8.349E+00	26	51.02	6.027E+00	38	75.51	5.289E+00	50	100.00	5.873E+00

13	24.49	8.322E+00
14	26.53	8.291E+00

DEPTH OR VELOCITY DEPENDENT VARIABLES.
BASED ON FLOWS FOR THE PERIOD JAN. 11, 1973 THRU JAN. 15, 1973

CROSSECTIONAL AREAS OF CHANNELS (SQFT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	4.788E+04	38	76.53	3.177E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	4.666E+04	39	78.57	3.062E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	4.545E+04	40	80.61	2.946E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	4.424E+04	41	82.65	2.831E+04
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	4.303E+04	42	84.69	2.715E+04
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	4.182E+04	43	86.73	2.600E+04
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	4.061E+04	44	88.77	2.484E+04
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	3.939E+04	45	90.82	2.369E+04
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	3.818E+04	46	92.86	2.253E+04
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	3.697E+04	47	94.90	2.138E+04
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	3.576E+04	48	96.94	2.022E+04
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	3.455E+04	49	98.98	1.907E+04
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	9.575E+00	38	76.53	6.354E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	9.333E+00	39	78.57	6.123E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	9.090E+00	40	80.61	5.892E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	8.848E+00	41	82.65	5.661E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	8.606E+00	42	84.69	5.430E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	8.363E+00	43	86.73	5.199E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	8.121E+00	44	88.77	4.968E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	7.879E+00	45	90.82	4.737E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	7.636E+00	46	92.86	4.506E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	7.394E+00	47	94.90	4.275E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	7.152E+00	48	96.94	4.044E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	6.909E+00	49	98.98	3.813E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	1.358E-01	38	76.53	1.889E-01
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	1.393E-01	39	78.57	1.960E-01
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	1.430E-01	40	80.61	2.037E-01
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	1.469E-01	41	82.65	2.120E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	1.511E-01	42	84.69	2.210E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	1.554E-01	43	86.73	2.308E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	1.601E-01	44	88.77	2.415E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	1.650E-01	45	90.82	2.533E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	1.702E-01	46	92.86	2.663E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	1.758E-01	47	94.90	2.807E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	1.818E-01	48	96.94	2.967E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	1.882E-01	49	98.98	3.147E-01
13	25.51	1.500E+00									

********** JUNCTION VOLUMES (CUFT) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09	15	28.57	1.156E+09	27	53.06	5.098E+08	39	77.55	3.364E+08
2	2.04	1.585E+09	16	30.61	1.123E+09	28	55.10	4.968E+08	40	79.59	3.240E+08
3	4.08	1.552E+09	17	32.65	1.090E+09	29	57.14	4.837E+08	41	81.63	3.115E+08
4	6.12	1.519E+09	18	34.69	1.057E+09	30	59.18	4.706E+08	42	83.67	2.991E+08
5	8.16	1.486E+09	19	36.73	1.024E+09	31	61.22	4.576E+08	43	85.71	2.866E+08
6	10.20	1.453E+09	20	38.78	9.905E+08	32	63.26	4.445E+08	44	87.75	2.742E+08
7	12.24	1.420E+09	21	40.82	9.575E+08	33	65.31	4.314E+08	45	89.80	2.617E+08
8	14.29	1.387E+09	22	42.86	9.245E+08	34	67.35	4.183E+08	46	91.84	2.492E+08
9	16.33	1.354E+09	23	44.90	8.915E+08	35	69.39	4.053E+08	47	93.88	2.368E+08
10	18.37	1.321E+09	24	46.94	8.585E+08	36	71.43	3.922E+08	48	95.92	2.243E+08
11	20.41	1.288E+09	25	48.98	8.254E+08	37	73.47	3.791E+08	49	97.96	2.119E+08
12	22.45	1.255E+09	26	51.02	6.627E+08	38	75.51	3.576E+08	50	100.00	2.056E+08
13	24.49	1.222E+09									
14	26.53	1.189E+09									

********** COMPUTED REAERATION RATES (1/DAY) **********

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01	15	28.57	3.062E-01	27	53.06	1.854E-01	39	77.55	4.092E-01
2	2.04	3.062E-01	16	30.61	3.062E-01	28	55.10	1.953E-01	40	79.59	4.413E-01
3	4.08	3.062E-01	17	32.65	3.062E-01	29	57.14	2.060E-01	41	81.63	4.774E-01
4	6.12	3.062E-01	18	34.69	3.062E-01	30	59.18	2.176E-01	42	83.67	5.180E-01
5	8.16	3.062E-01	19	36.73	3.062E-01	31	61.22	2.302E-01	43	85.71	5.641E-01
6	10.20	3.062E-01	20	38.78	3.062E-01	32	63.26	2.439E-01	44	87.75	6.166E-01
7	12.24	3.062E-01	21	40.82	3.062E-01	33	65.31	2.589E-01	45	89.80	6.768E-01
8	14.29	3.062E-01	22	42.86	3.062E-01	34	67.35	2.754E-01	46	91.84	7.463E-01
9	16.33	3.062E-01	23	44.90	3.062E-01	35	69.39	2.934E-01	47	93.88	8.270E-01
10	18.37	3.062E-01	24	46.94	3.062E-01	36	71.43	3.133E-01	48	95.92	9.216E-01
11	20.41	3.062E-01	25	48.98	3.062E-01	37	73.47	3.353E-01	49	97.96	1.034E+00
12	22.45	3.062E-01	26	51.02	2.434E-01	38	75.51	3.705E-01	50	100.00	1.094E+00
13	24.49	3.062E-01									
14	26.53	3.062E-01									

FLOW CONDITIONS FOR JAN. 11, 1973 THRU JAN. 15, 1973

NUMBER OF DAYS IN THIS PERIOD = 5
TOTAL INFLOWS = 6500.00 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 6500.00 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	6.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	6.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-6.500E+03	14	27.55	-6.500E+03	26	52.04	-6.500E+03	38	76.53	-6.000E+03
2	3.06	-6.500E+03	15	29.59	-6.500E+03	27	54.08	-6.500E+03	39	78.57	-6.000E+03
3	5.10	-6.500E+03	16	31.63	-6.500E+03	28	56.12	-6.500E+03	40	80.61	-6.000E+03
4	7.14	-6.500E+03	17	33.67	-6.500E+03	29	58.16	-6.500E+03	41	82.65	-6.000E+03
5	9.18	-6.500E+03	18	35.71	-6.500E+03	30	60.20	-6.500E+03	42	84.69	-6.000E+03
6	11.22	-6.500E+03	19	37.75	-6.500E+03	31	62.24	-6.500E+03	43	86.73	-6.000E+03
7	13.27	-6.500E+03	20	39.80	-6.500E+03	32	64.29	-6.500E+03	44	88.77	-6.000E+03
8	15.31	-6.500E+03	21	41.84	-6.500E+03	33	66.33	-6.500E+03	45	90.82	-6.000E+03

9	17.35	-6.500E+03	22	43.88	-6.500E+03	34	68.37	-6.500E+03	46	92.86	-6.000E+03
10	19.39	-6.500E+03	23	45.92	-6.500E+03	35	70.41	-6.500E+03	47	94.90	-6.000E+03
11	21.43	-6.500E+03	24	47.96	-6.500E+03	36	72.45	-6.500E+03	48	96.94	-6.000E+03
12	23.47	-6.500E+03	25	50.00	-6.500E+03	37	74.49	-6.500E+03	49	98.98	-6.000E+03
13	25.51	-6.500E+03									

TDS INPUT CONCENTRATIONS FOR JAN. 11, 1973 THRU JAN. 15, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS
JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 1.8000E+04 (PPM)

AUTOQD - TEST PROBLEM

TDS CONCENTRATIONS FOR THE PERICD JAN. 11, 1973 THRU JAN. 15, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

********** TDS CONCENTRATIONS (PPM) ON JAN. 11, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	2.393E+03	27	53.06	2.833E-02	39	77.55	1.012E-17
2	2.04	1.601E+04	16	30.61	1.838E+03	28	55.10	1.815E-03	40	79.59	3.204E-19
3	4.08	1.419E+04	17	32.65	1.363E+03	29	57.14	1.172E-04	41	81.63	9.188E-21
4	6.12	1.259E+04	18	34.69	9.692E+02	30	59.18	7.514E-06	42	83.67	2.388E-22
5	8.16	1.121E+04	19	36.73	6.543E+02	31	61.22	4.703E-07	43	85.71	5.625E-24
6	10.20	1.002E+04	20	38.78	4.142E+02	32	63.26	2.829E-08	44	87.75	1.201E-25
7	12.24	8.965E+03	21	40.82	2.414E+02	33	65.31	1.610E-09	45	89.80	2.325E-27
8	14.29	7.985E+03	22	42.86	1.261E+02	34	67.35	8.552E-11	46	91.84	4.076E-29
9	16.33	7.053E+03	23	44.90	5.656E+01	35	69.39	4.195E-12	47	93.88	6.467E-31
10	18.37	6.158E+03	24	46.94	2.018E+01	36	71.43	1.887E-13	48	95.92	9.276E-33
11	20.41	5.300E+03	25	48.98	4.869E+00	37	73.47	7.747E-15	49	97.96	1.201E-34
12	22.45	4.486E+03	26	51.02	4.502E-01	38	75.51	2.893E-16	50	100.00	1.393E-36
13	24.49	3.724E+03									
14	26.53	3.024E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 12, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	2.363E+03	27	53.06	2.875E-02	39	77.55	9.663E-18
2	2.04	1.6[illegible]E+04	16	30.61	1.818E+03	28	55.10	1.748E-03	40	79.59	3.226E-19
3	4.08	1.4[illegible]E+04	17	32.65	1.350E+03	29	57.14	1.065E-04	41	81.63	9.783E-21
4	6.12	1.2[illegible]E+04	18	34.69	9.615E+02	30	59.18	6.492E-06	42	83.67	2.693E-22
5	8.16	1.15[illegible]E+04	19	36.73	6.505E+02	31	61.22	3.914E-07	43	85.71	6.729E-24
6	10.20	1.02[illegible]E+04	20	38.78	4.128E+02	32	63.26	2.300E-08	44	87.75	1.525E-25
7	12.24	9.061E+03	21	40.82	2.414E+02	33	65.31	1.297E-09	45	89.80	3.136E-27
8	14.29	7.992E+03	22	42.86	1.266E+02	34	67.35	6.917E-11	46	91.84	5.842E-29
9	16.33	7.006E+03	23	44.90	5.711E+01	35	69.39	3.449E-12	47	93.88	9.851E-31
10	18.37	6.087E+03	24	46.94	2.053E+01	36	71.43	1.593E-13	48	95.92	1.502E-32
11	20.41	5.226E+03	25	48.98	5.002E+00	37	73.47	6.770E-15	49	97.96	2.065E-34
12	22.45	4.419E+03	26	51.02	4.672E-01	38	75.51	2.632E-16	50	100.00	2.547E-36
13	24.49	3.669E+03									
14	26.53	2.982E+03									

********** TDS CONCENTRATIONS (PPM) ON JAN. 13, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	2.333E+03	27	53.06	2.948E-02	39	77.55	8.674E-18
2	2.04	1.630E+04	16	30.61	1.796E+03	28	55.10	1.752E-03	40	79.59	3.017E-19
3	4.08	1.468E+04	17	32.65	1.336E+03	29	57.14	1.024E-04	41	81.63	9.566E-21
4	6.12	1.314E+04	18	34.69	9.531E+02	30	59.18	5.931E-06	42	83.67	2.761E-22
5	8.16	1.171E+04	19	36.73	6.461E+02	31	61.22	3.412E-07	43	85.71	7.247E-24
6	10.20	1.038E+04	20	38.78	4.110E+02	32	63.26	1.932E-08	44	87.75	1.728E-25

7	12.24	9.162E+03	21	40.82	2.410E+02	33	65.31	1.0[illegible]E-09	45	89.80	3.[illegible]E-27
8	14.29	8.041E+03	22	42.86	1.268E+02	34	67.35	5.618E-11	46	91.84	7.[illegible]E-29
9	16.33	7.011E+03	23	44.90	5.746E+01	35	69.39	2.807E-12	47	93.88	1.[illegible]E-30
10	18.37	6.060E+03	24	46.94	2.078E+01	36	71.43	1.313E-13	48	95.92	2.[illegible]E-32
11	20.41	5.182E+03	25	48.98	5.101E+00	37	73.47	5.701E-15	49	97.96	3.[illegible]E-34
12	22.45	4.370E+03	26	51.02	4.803E-01	38	75.51	2.279E-16	50	100.00	3.[illegible]E-36
13	24.49	3.623E+03									
14	26.53	2.943E+03									

•••••••••• TDS CONCENTRATIONS (PPM) ON JAN. 14, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	2.306E+03	27	53.06	3.017E-02	39	77.55	7.461E-18
2	2.04	1.634E+04	16	30.61	1.776E+03	28	55.10	1.782E-03	40	79.59	2.674E-19
3	4.08	1.475E+04	17	32.65	1.322E+03	29	57.14	1.019E-04	41	81.63	8.775E-21
4	6.12	1.324E+04	18	34.69	9.441E+02	30	59.18	5.692E-06	42	83.67	2.630E-22
5	8.16	1.181E+04	19	36.73	6.410E+02	31	61.22	3.133E-07	43	85.71	7.186E-24
6	10.20	1.044E+04	20	38.78	4.086E+02	32	63.26	1.699E-08	44	87.75	1.786E-25
7	12.24	9.238E+03	21	40.82	2.402E+02	33	65.31	9.034E-10	45	89.80	4.035E-27
8	14.29	8.090E+03	22	42.86	1.268E+02	34	67.35	4.656E-11	46	91.84	8.266E-29
9	16.33	7.031E+03	23	44.90	5.765E+01	35	69.39	2.299E-12	47	93.88	1.533E-30
10	18.37	6.055E+03	24	46.94	2.094E+01	36	71.43	1.074E-13	48	95.92	2.571E-32
11	20.41	5.159E+03	25	48.98	5.172E+00	37	73.47	4.708E-15	49	97.96	3.886E-34
12	22.45	4.337E+03	26	51.02	4.903E-01	38	75.51	1.913E-16	50	100.00	5.273E-36
13	24.49	3.588E+03									
14	26.53	2.911E+03									

•••••••••• TDS CONCENTRATIONS (PPM) ON JAN. 15, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.800E+04	15	28.57	2.283E+03	27	53.06	3.074E-02	39	77.55	6.254E-18
2	2.04	1.637E+04	16	30.61	1.757E+03	28	55.10	1.816E-03	40	79.59	2.285E-19
3	4.08	1.480E+04	17	32.65	1.308E+03	29	57.14	1.030E-04	41	81.63	7.687E-21
4	6.12	1.330E+04	18	34.69	9.351E+02	30	59.18	5.641E-06	42	83.67	2.371E-22
5	8.16	1.188E+04	19	36.73	6.356E+02	31	61.22	3.007E-07	43	85.71	6.686E-24
6	10.20	1.054E+04	20	38.78	4.058E+02	32	63.26	1.569E-08	44	87.75	1.719E-25
7	12.24	9.293E+03	21	40.82	2.390E+02	33	65.31	8.018E-10	45	89.80	4.023E-27
8	14.29	8.129E+03	22	42.86	1.265E+02	34	67.35	3.996E-11	46	91.84	8.546E-29
9	16.33	7.051E+03	23	44.90	5.770E+01	35	69.39	1.925E-12	47	93.88	1.645E-30
10	18.37	6.059E+03	24	46.94	2.104E+01	36	71.43	8.876E-14	48	95.92	2.863E-32
11	20.41	5.148E+03	25	48.98	5.220E+00	37	73.47	3.875E-15	49	97.96	4.491E-34
12	22.45	4.317E+03	26	51.02	4.976E-01	38	75.51	1.583E-16	50	100.00	6.326E-36
13	24.49	3.563E+03									
14	26.53	2.885E+03									

CBOD, NBOD AND DO INPUT CONC. FOR JAN. 11, 1973 THRU JAN. 15, 1973

CBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

NBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

DO INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0

12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+00	50	100.00	6.000E+00	
13	24.49	0.0										
14	26.51	0.0										

AUTOQD - TEST PROBLEM

CBOD, NBOD AND DO CONC FOR THE PERIOD JAN. 11, 1973 THRU JAN. 15, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 11, 1973

CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.362E-03	15	28.57	6.282E-03	27	53.06	2.514E-01	39	77.55	1.316E+00
2	2.04	1.385E-03	16	30.61	8.065E-03	28	55.10	3.106E-01	40	79.59	1.505E+00
3	4.08	1.431E-03	17	32.65	1.059E-02	29	57.14	3.806E-01	41	81.63	1.750E+00
4	6.12	1.500E-03	18	34.69	1.419E-02	30	59.18	4.640E-01	42	83.67	2.023E+00
5	8.16	1.595E-03	19	36.73	1.930E-02	31	61.22	5.638E-01	43	85.71	2.325E+00
6	10.20	1.716E-03	20	38.78	2.652E-02	32	63.26	6.837E-01	44	87.75	2.656E+00
7	12.24	1.867E-03	21	40.82	3.667E-02	33	65.31	8.279E-01	45	89.80	3.019E+00
8	14.29	2.055E-03	22	42.86	5.086E-02	34	67.35	1.002E+00	46	91.84	3.414E+00
9	16.33	2.287E-03	23	44.90	7.059E-02	35	69.39	1.215E+00	47	93.88	3.843E+00
10	18.37	2.580E-03	24	46.94	9.798E-02	36	71.43	1.486E+00	48	95.92	4.311E+00
11	20.41	2.955E-03	25	48.98	1.364E-01	37	73.47	1.834E+00	49	97.96	4.822E+00
12	22.45	3.448E-03	26	51.02	1.919E-01	38	75.51	2.257E+00	50	100.00	5.378E+00
13	24.49	4.110E-03									
14	26.53	5.017E-03									

NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.785E-02	15	28.57	8.698E-02	27	53.06	9.316E-01	39	77.55	2.504E+00
2	2.04	2.829E-02	16	30.61	1.015E-01	28	55.10	1.057E+00	40	79.59	2.710E+00
3	4.08	2.917E-02	17	32.65	1.203E-01	29	57.14	1.192E+00	41	81.63	2.958E+00
4	6.12	3.049E-02	18	34.69	1.446E-01	30	59.18	1.340E+00	42	83.67	3.217E+00
5	8.16	3.225E-02	19	36.73	1.762E-01	31	61.22	1.502E+00	43	85.71	3.486E+00
6	10.20	3.445E-02	20	38.78	2.170E-01	32	63.26	1.682E+00	44	87.75	3.764E+00
7	12.24	3.711E-02	21	40.82	2.691E-01	33	65.31	1.882E+00	45	89.80	4.051E+00
8	14.29	4.025E-02	22	42.86	3.348E-01	34	67.35	2.106E+00	46	91.84	4.347E+00
9	16.33	4.393E-02	23	44.90	4.163E-01	35	69.39	2.359E+00	47	93.88	4.652E+00
10	18.37	4.823E-02	24	46.94	5.162E-01	36	71.43	2.657E+00	48	95.92	4.968E+00
11	20.41	5.328E-02	25	48.98	6.384E-01	37	73.47	3.013E+00	49	97.96	5.296E+00
12	22.45	5.930E-02	26	51.02	7.907E-01	38	75.51	3.416E+00	50	100.00	5.636E+00
13	24.49	6.660E-02									
14	26.53	7.563E-02									

DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.528E+00	15	28.57	8.260E+00	27	53.06	5.704E+00	39	77.55	5.872E+00
2	2.04	8.524E+00	16	30.61	8.215E+00	28	55.10	5.542E+00	40	79.59	5.946E+00
3	4.08	8.516E+00	17	32.65	8.161E+00	29	57.14	5.407E+00	41	81.63	5.920E+00
4	6.12	8.505E+00	18	34.69	8.093E+00	30	59.18	5.291E+00	42	83.67	5.887E+00

5	8.16	8.493E+00	19	36.73	8.007E+00	31	61.22	5.191E+00	43	85.71	5.872E+00
6	10.20	8.478E+00	20	38.78	7.897E+00	32	63.26	5.108E+00	44	87.75	5.873E+00
7	12.24	8.462E+00	21	40.82	7.754E+00	33	65.31	5.043E+00	45	89.80	5.891E+00
8	14.29	8.444E+00	22	42.86	7.570E+00	34	67.35	5.001E+00	46	91.84	5.922E+00
9	16.33	8.425E+00	23	44.90	7.331E+00	35	69.39	4.990E+00	47	93.88	5.960E+00
10	18.37	8.404E+00	24	46.94	7.022E+00	36	71.43	5.017E+00	48	95.92	5.995E+00
11	20.41	8.381E+00	25	48.98	6.619E+00	37	73.47	5.100E+00	49	97.96	6.012E+00
12	22.45	8.356E+00	26	51.02	6.079E+00	38	75.51	5.284E+00	50	100.00	5.997E+00
13	24.49	8.328E+00									
14	26.53	8.297E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 12, 1973

••••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.089E-03	15	28.57	5.929E-03	27	53.06	2.436E-01	39	77.55	1.285E+00
2	2.04	1.107E-03	16	30.61	7.721E-03	28	55.10	3.007E-01	40	79.59	1.462E+00
3	4.08	1.144E-03	17	32.65	1.023E-02	29	57.14	3.690E-01	41	81.63	1.698E+00
4	6.12	1.201E-03	18	34.69	1.376E-02	30	59.18	4.515E-01	42	83.67	1.962E+00
5	8.16	1.280E-03	19	36.73	1.869E-02	31	61.22	5.518E-01	43	85.71	2.255E+00
6	10.20	1.384E-03	20	38.78	2.558E-02	32	63.26	6.745E-01	44	87.75	2.581E+00
7	12.24	1.517E-03	21	40.82	3.517E-02	33	65.31	8.266E-01	45	89.80	2.943E+00
8	14.29	1.687E-03	22	42.86	4.851E-02	34	67.35	1.017E+00	46	91.84	3.344E+00
9	16.33	1.904E-03	23	44.90	6.711E-02	35	69.39	1.256E+00	47	93.88	3.788E+00
10	18.37	2.185E-03	24	46.94	9.327E-02	36	71.43	1.548E+00	48	95.92	4.277E+00
11	20.41	2.556E-03	25	48.98	1.307E-01	37	73.47	1.888E+00	49	97.96	4.807E+00
12	22.45	3.050E-03	26	51.02	1.855E-01	38	75.51	2.268E+00	50	100.00	5.375E+00
13	24.49	3.722E-03									
14	26.53	4.646E-03									

••••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.518E-02	15	28.57	8.305E-02	27	53.06	9.170E-01	39	77.55	2.473E+00
2	2.04	2.556E-02	16	30.61	9.791E-02	28	55.10	1.039E+00	40	79.59	2.668E+00
3	4.08	2.631E-02	17	32.65	1.170E-01	29	57.14	1.173E+00	41	81.63	2.909E+00
4	6.12	2.746E-02	18	34.69	1.415E-01	30	59.18	1.320E+00	42	83.67	3.163E+00
5	8.16	2.901E-02	19	36.73	1.729E-01	31	61.22	1.485E+00	43	85.71	3.427E+00
6	10.20	3.097E-02	20	38.78	2.129E-01	32	63.26	1.671E+00	44	87.75	3.703E+00
7	12.24	3.338E-02	21	40.82	2.635E-01	33	65.31	1.883E+00	45	89.80	3.992E+00
8	14.29	3.627E-02	22	42.86	3.269E-01	34	67.35	2.127E+00	46	91.84	4.295E+00
9	16.33	3.972E-02	23	44.90	4.055E-01	35	69.39	2.411E+00	47	93.88	4.612E+00
10	18.37	4.384E-02	24	46.94	5.028E-01	36	71.43	2.732E+00	48	95.92	4.943E+00
11	20.41	4.879E-02	25	48.98	6.240E-01	37	73.47	3.078E+00	49	97.96	5.285E+00
12	22.45	5.479E-02	26	51.02	7.772E-01	38	75.51	3.431E+00	50	100.00	5.634E+00
13	24.49	6.218E-02									
14	26.53	7.140E-02									

••••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.532E+00	15	28.57	8.264E+00	27	53.06	5.761E+00	39	77.55	6.004E+00
2	2.04	8.528E+00	16	30.61	8.219E+00	28	55.10	5.606E+00	40	79.59	6.097E+00
3	4.08	8.520E+00	17	32.65	8.165E+00	29	57.14	5.475E+00	41	81.63	6.080E+00
4	6.12	8.510E+00	18	34.69	8.097E+00	30	59.18	5.357E+00	42	83.67	6.052E+00
5	8.16	8.498E+00	19	36.73	8.012E+00	31	61.22	5.250E+00	43	85.71	6.037E+00
6	10.20	8.483E+00	20	38.78	7.903E+00	32	63.26	5.155E+00	44	87.75	6.032E+00

7	12.24	8.467E+00	21	40.82	7.765E+00	33	65.31	5.076E+00	45	89.80	6.035E+00
8	14.29	8.449E+00	22	42.86	7.587E+00	34	67.35	5.015E+00	46	91.84	6.040E+00
9	16.33	8.430E+00	23	44.90	7.357E+00	35	69.39	4.985E+00	47	93.88	6.043E+00
10	18.37	8.410E+00	24	46.94	7.058E+00	36	71.43	5.006E+00	48	95.92	6.041E+00
11	20.41	8.387E+00	25	48.98	6.662E+00	37	73.47	5.117E+00	49	97.96	6.030E+00
12	22.45	8.362E+00	26	51.02	6.128E+00	38	75.51	5.358E+00	50	100.00	6.001E+00
13	24.49	8.334E+00									
14	26.53	8.302E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 13, 1973

••••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.723E-04	15	28.57	5.641E-03	27	53.06	2.362E-01	39	77.55	1.249E+00
2	2.04	8.878E-04	16	30.61	7.409E-03	28	55.10	2.925E-01	40	79.59	1.420E+00
3	4.08	9.196E-04	17	32.65	9.861E-03	29	57.14	3.606E-01	41	81.63	1.649E+00
4	6.12	9.692E-04	18	34.69	1.326E-02	30	59.18	4.447E-01	42	83.67	1.910E+00
5	8.16	1.039E-03	19	36.73	1.798E-02	31	61.22	5.492E-01	43	85.71	2.203E+00
6	10.20	1.132E-03	20	38.78	2.453E-02	32	63.26	6.801E-01	44	87.75	2.534E+00
7	12.24	1.255E-03	21	40.82	3.362E-02	33	65.31	8.439E-01	45	89.80	2.905E+00
8	14.29	1.415E-03	22	42.86	4.629E-02	34	67.35	1.046E+00	46	91.84	3.319E+00
9	16.33	1.624E-03	23	44.90	6.409E-02	35	69.39	1.288E+00	47	93.88	3.775E+00
10	18.37	1.900E-03	24	46.94	8.941E-02	36	71.43	1.569E+00	48	95.92	4.272E+00
11	20.41	2.268E-03	25	48.98	1.260E-01	37	73.47	1.888E+00	49	97.96	4.806E+00
12	22.45	2.764E-03	26	51.02	1.796E-01	38	75.51	2.247E+00	50	100.00	5.375E+00
13	24.49	3.439E-03									
14	26.53	4.364E-03									

••••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.272E-02	15	28.57	7.980E-02	27	53.06	9.024E-01	39	77.55	2.435E+00
2	2.04	2.305E-02	16	30.61	9.482E-02	28	55.10	1.024E+00	40	79.59	2.625E+00
3	4.08	2.373E-02	17	32.65	1.139E-01	29	57.14	1.158E+00	41	81.63	2.862E+00
4	6.12	2.476E-02	18	34.69	1.383E-01	30	59.18	1.309E+00	42	83.67	3.114E+00
5	8.16	2.616E-02	19	36.73	1.693E-01	31	61.22	1.482E+00	43	85.71	3.380E+00
6	10.20	2.796E-02	20	38.78	2.084E-01	32	63.26	1.680E+00	44	87.75	3.662E+00
7	12.24	3.019E-02	21	40.82	2.575E-01	33	65.31	1.908E+00	45	89.80	3.960E+00
8	14.29	3.292E-02	22	42.86	3.190E-01	34	67.35	2.168E+00	46	91.84	4.274E+00
9	16.33	3.622E-02	23	44.90	3.956E-01	35	69.39	2.456E+00	47	93.88	4.601E+00
10	18.37	4.024E-02	24	46.94	4.914E-01	36	71.43	2.763E+00	48	95.92	4.939E+00
11	20.41	4.513E-02	25	48.98	6.118E-01	37	73.47	3.081E+00	49	97.96	5.284E+00
12	22.45	5.115E-02	26	51.02	7.643E-01	38	75.51	3.409E+00	50	100.00	5.634E+00
13	24.49	5.862E-02									
14	26.53	6.798E-02									

••••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.536E+00	15	28.57	8.268E+00	27	53.06	5.817E+00	39	77.55	6.116E+00
2	2.04	8.532E+00	16	30.61	8.223E+00	28	55.10	5.664E+00	40	79.59	6.213E+00
3	4.08	8.524E+00	17	32.65	8.168E+00	29	57.14	5.530E+00	41	81.63	6.194E+00
4	6.12	8.514E+00	18	34.69	8.101E+00	30	59.18	5.404E+00	42	83.67	6.159E+00
5	8.16	8.502E+00	19	36.73	8.017E+00	31	61.22	5.285E+00	43	85.71	6.130E+00
6	10.20	8.487E+00	20	38.78	7.912E+00	32	63.26	5.174E+00	44	87.75	6.107E+00
7	12.24	8.472E+00	21	40.82	7.778E+00	33	65.31	5.077E+00	45	89.80	6.087E+00
8	14.29	8.454E+00	22	42.86	7.605E+00	34	67.35	5.006E+00	46	91.84	6.071E+00

9	16.33	8.435E+00	23	44.90	7.382E+00	35	69.39	4.980E+00	47	93.88	6.058E+00
10	18.37	8.414E+00	24	46.94	7.089E+00	36	71.43	5.028E+00	48	95.92	6.046E+00
11	20.41	8.392E+00	25	48.98	6.700E+00	37	73.47	5.177E+00	49	97.96	6.031E+00
12	22.45	8.366E+00	26	51.02	6.175E+00	38	75.51	5.448E+00	50	100.00	6.002E+00
13	24.49	8.338E+00									
14	26.53	8.306E+00									

********** CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 14, 1973

********** CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	7.031E-04	15	28.57	5.385E-03	27	53.06	2.306E-01	39	77.55	1.216E+00
2	2.04	7.170E-04	16	30.61	7.105E-03	28	55.10	2.873E-01	40	79.59	1.384E+00
3	4.08	7.458E-04	17	32.65	9.472E-03	29	57.14	3.574E-01	41	81.63	1.613E+00
4	6.12	7.909E-04	18	34.69	1.273E-02	30	59.18	4.455E-01	42	83.67	1.876E+00
5	8.16	8.552E-04	19	36.73	1.724E-02	31	61.22	5.560E-01	43	85.71	2.176E+00
6	10.20	9.426E-04	20	38.78	2.347E-02	32	63.26	6.935E-01	44	87.75	2.514E+00
7	12.24	1.059E-03	21	40.82	3.215E-02	33	65.31	8.615E-01	45	89.80	2.893E+00
8	14.29	1.213E-03	22	42.86	4.430E-02	34	67.35	1.062E+00	46	91.84	3.313E+00
9	16.33	1.418E-03	23	44.90	6.149E-02	35	69.39	1.295E+00	47	93.88	3.773E+00
10	18.37	1.690E-03	24	46.94	8.612E-02	36	71.43	1.564E+00	48	95.92	4.271E+00
11	20.41	2.055E-03	25	48.98	1.219E-01	37	73.47	1.870E+00	49	97.96	4.806E+00
12	22.45	2.549E-03	26	51.02	1.745E-01	38	75.51	2.221E+00	50	100.00	5.375E+00
13	24.49	3.210E-03									
14	26.53	4.136E-03									

********** NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.050E-02	15	28.57	7.699E-02	27	53.06	8.904E-01	39	77.55	2.398E+00
2	2.04	2.080E-02	16	30.61	9.202E-02	28	55.10	1.013E+00	40	79.59	2.586E+00
3	4.08	2.142E-02	17	32.65	1.110E-01	29	57.14	1.152E+00	41	81.63	2.824E+00
4	6.12	2.237E-02	18	34.69	1.351E-01	30	59.18	1.310E+00	42	83.67	3.080E+00
5	8.16	2.367E-02	19	36.73	1.654E-01	31	61.22	1.493E+00	43	85.71	3.353E+00
6	10.20	2.536E-02	20	38.78	2.036E-01	32	63.26	1.702E+00	44	87.75	3.643E+00
7	12.24	2.747E-02	21	40.82	2.516E-01	33	65.31	1.937E+00	45	89.80	3.949E+00
8	14.29	3.009E-02	22	42.86	3.116E-01	34	67.35	2.195E+00	46	91.84	4.268E+00
9	16.33	3.331E-02	23	44.90	3.868E-01	35	69.39	2.470E+00	47	93.88	4.599E+00
10	18.37	3.727E-02	24	46.94	4.815E-01	36	71.43	2.759E+00	48	95.92	4.938E+00
11	20.41	4.213E-02	25	48.98	6.010E-01	37	73.47	3.062E+00	49	97.96	5.284E+00
12	22.45	4.817E-02	26	51.02	7.526E-01	38	75.51	3.379E+00	50	100.00	5.634E+00
13	24.49	5.568E-02									
14	26.53	6.511E-02									

********** DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.539E+00	15	28.57	8.271E+00	27	53.06	5.866E+00	39	77.55	6.201E+00
2	2.04	8.535E+00	16	30.61	8.227E+00	28	55.10	5.709E+00	40	79.59	6.293E+00
3	4.08	8.528E+00	17	32.65	8.173E+00	29	57.14	5.567E+00	41	81.63	6.264E+00
4	6.12	8.518E+00	18	34.69	8.106E+00	30	59.18	5.428E+00	42	83.67	6.216E+00
5	8.16	8.505E+00	19	36.73	8.024E+00	31	61.22	5.294E+00	43	85.71	6.171E+00
6	10.20	8.491E+00	20	38.78	7.921E+00	32	63.26	5.170E+00	44	87.75	6.133E+00
7	12.24	8.475E+00	21	40.82	7.791E+00	33	65.31	5.069E+00	45	89.80	6.101E+00
8	14.29	8.458E+00	22	42.86	7.623E+00	34	67.35	5.006E+00	46	91.84	6.077E+00
9	16.33	8.439E+00	23	44.90	7.405E+00	35	69.39	5.003E+00	47	93.88	6.060E+00
10	18.37	8.418E+00	24	46.94	7.118E+00	36	71.43	5.077E+00	48	95.92	6.047E+00

11	20.41	8.395E+00	25	48.98	6.736E+00	37	73.47	5.246E+00	49	97.96	6.031E+00
12	22.45	8.370E+00	26	51.02	6.220E+00	38	75.51	5.527E+00	50	100.00	6.092E+00
13	24.49	8.342E+00									
14	26.53	8.309E+00									

********** CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 15. 1973

********** CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	5.721E-04	15	28.57	5.144E-03	27	53.06	2.276E-01	39	77.55	1.191E+00
2	2.04	5.853E-04	16	30.61	6.804E-03	28	55.10	2.861E-01	40	79.59	1.359E+00
3	4.08	6.123E-04	17	32.65	9.079E-03	29	57.14	3.593E-01	41	81.63	1.592E+00
4	6.12	6.549E-04	18	34.69	1.220E-02	30	59.18	4.512E-01	42	83.67	1.861E+00
5	8.16	7.160E-04	19	36.73	1.651E-02	31	61.22	5.651E-01	43	85.71	2.165E+00
6	10.20	7.998E-04	20	38.78	2.248E-02	32	63.26	7.037E-01	44	87.75	2.508E+00
7	12.24	9.127E-04	21	40.82	3.082E-02	33	65.31	8.691E-01	45	89.80	2.890E+00
8	14.29	1.063E-03	22	42.86	4.255E-02	34	67.35	1.063E+00	46	91.84	3.312E+00
9	16.33	1.264E-03	23	44.90	5.925E-02	35	69.39	1.289E+00	47	93.88	3.772E+00
10	18.37	1.533E-03	24	46.94	8.332E-02	36	71.43	1.549E+00	48	95.92	4.271E+00
11	20.41	1.893E-03	25	46.98	1.185E-01	37	73.47	1.851E+00	49	97.96	4.806E+00
12	22.45	2.378E-03	26	51.02	1.708E-01	38	75.51	2.199E+00	50	100.00	5.375E+00
13	24.49	3.036E-03									
14	26.53	3.928E-03									

********** NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.852E-02	15	28.57	7.449E-02	27	53.06	8.833E-01	39	77.55	2.368E+00
2	2.04	1.880E-02	16	30.61	8.940E-02	28	55.10	1.010E+00	40	79.59	2.557E+00
3	4.08	1.938E-02	17	32.65	1.082E-01	29	57.14	1.155E+00	41	81.63	2.801E+00
4	6.12	2.028E-02	18	34.69	1.319E-01	30	59.18	1.321E+00	42	83.67	3.062E+00
5	8.16	2.151E-02	19	36.73	1.616E-01	31	61.22	1.510E+00	43	85.71	3.341E+00
6	10.20	2.312E-02	20	38.78	1.990E-01	32	63.26	1.721E+00	44	87.75	3.636E+00
7	12.24	2.517E-02	21	40.82	2.459E-01	33	65.31	1.953E+00	45	89.80	3.946E+00
8	14.29	2.772E-02	22	42.86	3.048E-01	34	67.35	2.201E+00	46	91.84	4.267E+00
9	16.33	3.088E-02	23	44.90	3.790E-01	35	69.39	2.464E+00	47	93.88	4.599E+00
10	18.37	3.480E-02	24	46.94	4.728E-01	36	71.43	2.741E+00	48	95.92	4.938E+00
11	20.41	3.965E-02	25	48.98	5.917E-01	37	73.47	3.036E+00	49	97.96	5.284E+00
12	22.45	4.568E-02	26	51.02	7.434E-01	38	75.51	3.351E+00	50	100.00	5.634E+00
13	24.49	5.321E-02									
14	26.53	6.264E-02									

********** DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.542E+00	15	28.57	8.275E+00	27	53.06	5.902E+00	39	77.55	6.259E+00
2	2.04	8.538E+00	16	30.61	8.230E+00	28	55.10	5.737E+00	40	79.59	6.341E+00
3	4.08	8.531E+00	17	32.65	8.177E+00	29	57.14	5.583E+00	41	81.63	6.301E+00
4	6.12	8.521E+00	18	34.69	8.112E+00	30	59.18	5.432E+00	42	83.67	6.240E+00
5	8.16	8.508E+00	19	36.73	8.032E+00	31	61.22	5.290E+00	43	85.71	6.186E+00
6	10.20	8.494E+00	20	38.78	7.931E+00	32	63.26	5.166E+00	44	87.75	6.140E+00
7	12.24	8.478E+00	21	40.82	7.804E+00	33	65.31	5.073E+00	45	89.80	6.104E+00
8	14.29	8.461E+00	22	42.86	7.640E+00	34	67.35	5.028E+00	46	91.84	6.078E+00
9	16.33	8.442E+00	23	44.90	7.426E+00	35	69.39	5.044E+00	47	93.88	6.060E+00
10	18.37	8.421E+00	24	46.94	7.145E+00	36	71.43	5.132E+00	48	95.92	6.047E+00
11	20.41	8.399E+00	25	48.98	6.768E+00	37	73.47	5.307E+00	49	97.96	6.031E+00
12	22.45	8.373E+00	26	51.02	6.258E+00	38	75.51	5.587E+00	50	100.00	6.002E+00

13	24.44	8.345E+00
14	26.53	8.312E+00

DEPTH OR VELOCITY DEPENDENT VARIABLES.
BASED ON FLOWS FOR THE PERIOD JAN. 16, 1973 THRU JAN. 20, 1973

CROSSECTIONAL AREAS OF CHANNELS (SQFT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.485E+05	14	27.55	1.087E+05	26	52.04	4.331E+04	38	76.53	2.848E+04
2	3.06	1.454E+05	15	29.59	1.056E+05	27	54.08	4.221E+04	39	78.57	2.744E+04
3	5.10	1.423E+05	16	31.63	1.026E+05	28	56.12	4.112E+04	40	80.61	2.641E+04
4	7.14	1.393E+05	17	33.67	9.949E+04	29	58.16	4.002E+04	41	82.65	2.537E+04
5	9.18	1.362E+05	18	35.71	9.643E+04	30	60.20	3.893E+04	42	84.69	2.434E+04
6	11.22	1.332E+05	19	37.75	9.337E+04	31	62.24	3.783E+04	43	86.73	2.330E+04
7	13.27	1.301E+05	20	39.80	9.031E+04	32	64.29	3.673E+04	44	88.77	2.227E+04
8	15.31	1.270E+05	21	41.84	8.725E+04	33	66.33	3.564E+04	45	90.82	2.123E+04
9	17.35	1.240E+05	22	43.88	8.418E+04	34	68.37	3.454E+04	46	92.86	2.020E+04
10	19.39	1.209E+05	23	45.92	8.112E+04	35	70.41	3.344E+04	47	94.90	1.916E+04
11	21.43	1.179E+05	24	47.96	7.806E+04	36	72.45	3.235E+04	48	96.94	1.813E+04
12	23.47	1.148E+05	25	50.00	7.500E+04	37	74.49	3.125E+04	49	98.98	1.709E+04
13	25.51	1.117E+05									

CHANNEL DEPTHS (FT)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+01	14	27.55	1.500E+01	26	52.04	8.662E+00	38	76.53	5.696E+00
2	3.06	1.500E+01	15	29.59	1.500E+01	27	54.08	8.443E+00	39	78.57	5.489E+00
3	5.10	1.500E+01	16	31.63	1.500E+01	28	56.12	8.224E+00	40	80.61	5.282E+00
4	7.14	1.500E+01	17	33.67	1.500E+01	29	58.16	8.004E+00	41	82.65	5.075E+00
5	9.18	1.500E+01	18	35.71	1.500E+01	30	60.20	7.785E+00	42	84.69	4.868E+00
6	11.22	1.500E+01	19	37.75	1.500E+01	31	62.24	7.566E+00	43	86.73	4.660E+00
7	13.27	1.500E+01	20	39.80	1.500E+01	32	64.29	7.346E+00	44	88.77	4.453E+00
8	15.31	1.500E+01	21	41.84	1.500E+01	33	66.33	7.127E+00	45	90.82	4.246E+00
9	17.35	1.500E+01	22	43.88	1.500E+01	34	68.37	6.908E+00	46	92.86	4.039E+00
10	19.39	1.500E+01	23	45.92	1.500E+01	35	70.41	6.689E+00	47	94.90	3.832E+00
11	21.43	1.500E+01	24	47.96	1.500E+01	36	72.45	6.469E+00	48	96.94	3.625E+00
12	23.47	1.500E+01	25	50.00	1.500E+01	37	74.49	6.250E+00	49	98.98	3.418E+00
13	25.51	1.500E+01									

CHANNEL VELOCITIES (FT/SEC)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	1.500E+00	14	27.55	1.500E+00	26	52.04	1.270E-01	38	76.53	1.756E-01
2	3.06	1.500E+00	15	29.59	1.500E+00	27	54.08	1.303E-01	39	78.57	1.822E-01
3	5.10	1.500E+00	16	31.63	1.500E+00	28	56.12	1.338E-01	40	80.61	1.893E-01
4	7.14	1.500E+00	17	33.67	1.500E+00	29	58.16	1.374E-01	41	82.65	1.971E-01
5	9.18	1.500E+00	18	35.71	1.500E+00	30	60.20	1.413E-01	42	84.69	2.054E-01
6	11.22	1.500E+00	19	37.75	1.500E+00	31	62.24	1.454E-01	43	86.73	2.146E-01
7	13.27	1.500E+00	20	39.80	1.500E+00	32	64.29	1.497E-01	44	88.77	2.245E-01
8	15.31	1.500E+00	21	41.84	1.500E+00	33	66.33	1.543E-01	45	90.82	2.355E-01
9	17.35	1.500E+00	22	43.88	1.500E+00	34	68.37	1.592E-01	46	92.86	2.476E-01
10	19.39	1.500E+00	23	45.92	1.500E+00	35	70.41	1.645E-01	47	94.90	2.609E-01
11	21.43	1.500E+00	24	47.96	1.500E+00	36	72.45	1.700E-01	48	96.94	2.759E-01
12	23.47	1.500E+00	25	50.00	1.500E+00	37	74.49	1.760E-01	49	98.98	2.926E-01
13	25.51	1.500E+00									

JUNCTION VOLUMES (CUFT)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.601E+09	15	28.57	1.156E+09	27	53.06	4.612E+08	39	77.55	3.016E+08
2	2.04	1.585E+09	16	30.61	1.123E+09	28	55.10	4.494E+08	40	79.59	2.904E+08
3	4.08	1.552E+09	17	32.65	1.090E+09	29	57.14	4.376E+08	41	81.63	2.792E+08
4	6.12	1.519E+09	18	34.69	1.057E+09	30	59.18	4.257E+08	42	83.67	2.681E+08
5	8.16	1.486E+09	19	36.73	1.024E+09	31	61.22	4.139E+08	43	85.71	2.569E+08
6	10.20	1.453E+09	20	38.78	9.905E+08	32	63.26	4.021E+08	44	87.75	2.457E+08
7	12.24	1.420E+09	21	40.82	9.575E+08	33	65.31	3.903E+08	45	89.80	2.346E+08
8	14.29	1.387E+09	22	42.86	9.245E+08	34	67.35	3.784E+08	46	91.84	2.234E+08
9	16.33	1.354E+09	23	44.90	8.915E+08	35	69.39	3.666E+08	47	93.88	2.122E+08
10	18.37	1.321E+09	24	46.94	8.585E+08	36	71.43	3.548E+08	48	95.92	2.011E+08
11	20.41	1.288E+09	25	48.98	8.254E+08	37	73.47	3.430E+08	49	97.96	1.899E+08
12	22.45	1.255E+09	26	51.02	6.380E+08	38	75.51	3.221E+08	50	100.00	1.843E+08
13	24.49	1.222E+09									
14	26.53	1.189E+09									

COMPUTED REAERATION RATES (1/DAY)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.062E-01	15	28.57	3.062E-01	27	53.06	2.084E-01	39	77.55	4.649E-01
2	2.04	3.062E-01	16	30.61	3.062E-01	28	55.10	2.195E-01	40	79.59	5.014E-01
3	4.08	3.062E-01	17	32.65	3.062E-01	29	57.14	2.315E-01	41	81.63	5.423E-01
4	6.12	3.062E-01	18	34.69	3.062E-01	30	59.18	2.446E-01	42	83.67	5.885E-01
5	8.16	3.062E-01	19	36.73	3.062E-01	31	61.22	2.587E-01	43	85.71	6.409E-01
6	10.20	3.062E-01	20	38.78	3.062E-01	32	63.26	2.742E-01	44	87.75	7.005E-01
7	12.24	3.062E-01	21	40.82	3.062E-01	33	65.31	2.911E-01	45	89.80	7.689E-01
8	14.29	3.062E-01	22	42.86	3.062E-01	34	67.35	3.095E-01	46	91.84	8.479E-01
9	16.33	3.062E-01	23	44.90	3.062E-01	35	69.39	3.298E-01	47	93.88	9.396E-01
10	18.37	3.062E-01	24	46.94	3.062E-01	36	71.43	3.522E-01	48	95.92	1.047E+00
11	20.41	3.062E-01	25	48.98	3.062E-01	37	73.47	3.769E-01	49	97.96	1.174E+00
12	22.45	3.062E-01	26	51.02	2.546E-01	38	75.51	4.188E-01	50	100.00	1.243E+00
13	24.49	3.062E-01									
14	26.53	3.062E-01									

FLOW CONDITIONS FOR JAN. 16, 1973 THRU JAN. 20, 1973

NUMBER OF DAYS IN THIS PERIOD = 5
TOTAL INFLOWS = 5500.00 CFS
TOTAL DIVERSIONS = 0.0 CFS
OUTFLOW AT DOWNSTREAM JUNCTION = 5500.00 CFS

INFLOWS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	5.000E+02	50	100.00	5.000E+03
13	24.49	0.0									
14	26.53	0.0									

DIVERSIONS (CFS)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	5.500E+03	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

CHANNEL FLOWS (CFS)

CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE	CHAN NO	RIVER MILE	VALUE
1	1.02	-5.500E+03	14	27.55	-5.500E+03	26	52.04	-5.500E+03	38	76.53	-5.000E+03
2	3.06	-5.500E+03	15	29.59	-5.500E+03	27	54.08	-5.500E+03	39	78.57	-5.000E+03
3	5.10	-5.500E+03	16	31.63	-5.500E+03	28	56.12	-5.500E+03	40	80.61	-5.000E+03
4	7.14	-5.500E+03	17	33.67	-5.500E+03	29	58.16	-5.500E+03	41	82.65	-5.000E+03
5	9.18	-5.500E+03	18	35.71	-5.500E+03	30	60.20	-5.500E+03	42	84.69	-5.000E+03
6	11.22	-5.500E+03	19	37.75	-5.500E+03	31	62.24	-5.500E+03	43	86.73	-5.000E+03
7	13.27	-5.500E+03	20	39.80	-5.500E+03	32	64.29	-5.500E+03	44	88.77	-5.000E+03
8	15.31	-5.500E+03	21	41.84	-5.500E+03	33	66.33	-5.500E+03	45	90.82	-5.000E+03

10	17.35	-5.500E+03	22	43.88	-5.500E+03	34	68.37	-5.500E+03	46	92.86	-5.000E+03
11	19.39	-5.500E+03	23	45.92	-5.500E+03	35	70.41	-5.500E+03	47	94.90	-5.000E+03
11	21.43	-5.500E+03	24	47.96	-5.500E+03	36	72.45	-5.500E+03	48	96.94	-5.000E+03
12	23.47	-5.500E+03	25	50.00	-5.500E+03	37	74.49	-5.500E+03	49	98.98	-5.000E+03
13	25.51	-5.500E+03									

TDS INPUT CONCENTRATIONS FOR JAN. 16, 1973 THRU JAN. 20, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	0.0	50	100.00	0.0
13	24.49	0.0									
14	26.53	0.0									

FIXED JUNCTIONS
JUNCTION 1, RIVER MILE 0.0 , IS FIXED AT 2.0000E+04 (PPM)

AUTOQD - TEST PROBLEM

TDS CONCENTRATIONS FOR THE PERIOD JAN. 16, 1973 THRU JAN. 20, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

TDS CONCENTRATIONS (PPM) ON JAN. 16, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	2.303E+03	27	53.06	3.408E-02	39	77.55	5.738E-18
2	2.04	1.783E+04	16	30.61	1.775E+03	28	55.10	1.991E-03	40	79.59	2.127E-19
3	4.08	1.578E+04	17	32.65	1.325E+03	29	57.14	1.124E-04	41	81.63	7.297E-21
4	6.12	1.392E+04	18	34.69	9.501E+02	30	59.18	6.105E-06	42	83.67	2.306E-22
5	8.16	1.225E+04	19	36.73	6.489E+02	31	61.22	3.202E-07	43	85.71	6.689E-24
6	10.20	1.077E+04	20	38.78	4.168E+02	32	63.26	1.628E-08	44	87.75	1.775E-25
7	12.24	9.442E+03	21	40.82	2.474E+02	33	65.31	8.055E-10	45	89.80	4.296E-27
8	14.29	8.238E+03	22	42.86	1.322E+02	34	67.35	3.883E-11	46	91.84	9.459E-29
9	16.33	7.136E+03	23	44.90	6.106E+01	35	69.39	1.817E-12	47	93.88	1.890E-30
10	18.37	6.125E+03	24	46.94	2.263E+01	36	71.43	8.199E-14	48	95.92	3.417E-32
11	20.41	5.200E+03	25	48.98	5.732E+00	37	73.47	3.536E-15	49	97.96	5.575E-34
12	22.45	4.356E+03	26	51.02	5.650E-01	38	75.51	1.441E-16	50	100.00	8.168E-36
13	24.49	3.591E+03									
14	26.53	2.909E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 17, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	2.325E+03	27	53.06	3.797E-02	39	77.55	5.258E-18
2	2.04	1.802E+04	16	30.61	1.794E+03	28	55.10	2.209E-03	40	79.59	1.955E-19
3	4.08	1.610E+04	17	32.65	1.341E+03	29	57.14	1.237E-04	41	81.63	6.775E-21
4	6.12	1.430E+04	18	34.69	9.644E+02	30	59.18	6.667E-06	42	83.67	2.174E-22
5	8.16	1.262E+04	19	36.73	6.612E+02	31	61.22	3.461E-07	43	85.71	6.431E-24
6	10.20	1.108E+04	20	38.78	4.268E+02	32	63.26	1.732E-08	44	87.75	1.746E-25
7	12.24	9.675E+03	21	40.82	2.550E+02	33	65.31	8.374E-10	45	89.80	4.337E-27
8	14.29	8.405E+03	22	42.86	1.374E+02	34	67.35	3.924E-11	46	91.84	9.820E-29
9	16.33	7.253E+03	23	44.90	6.410E+01	35	69.39	1.782E-12	47	93.88	2.021E-30
10	18.37	6.208E+03	24	46.94	2.406E+01	36	71.43	7.823E-14	48	95.92	3.768E-32
11	20.41	5.260E+03	25	48.98	6.199E+00	37	73.47	3.301E-15	49	97.96	6.346E-34
12	22.45	4.401E+03	26	51.02	6.248E-01	38	75.51	1.327E-16	50	100.00	9.607E-36
13	24.49	3.627E+03									
14	26.53	2.936E+03									

TDS CONCENTRATIONS (PPM) ON JAN. 18, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	2.349E+03	27	53.06	4.176E-02	39	77.55	4.889E-18
2	2.04	1.811E+04	16	30.61	1.814E+03	28	55.10	2.446E-03	40	79.59	1.804E-19
3	4.08	1.627E+04	17	32.65	1.357E+03	29	57.14	1.369E-04	41	81.63	6.247E-21
4	6.12	1.452E+04	18	34.69	9.782E+02	30	59.18	7.342E-06	42	83.67	2.016E-22
5	8.16	1.286E+04	19	36.73	6.727E+02	31	61.22	3.782E-07	43	85.71	6.030E-24
6	10.20	1.132E+04	20	38.78	4.360E+02	32	63.26	1.872E-08	44	87.75	1.662E-25

7	12.24	9.889E+03	21	40.82	2.619E+02	33	65.31	8.916E-10	45	89.80	4.204E-27
8	14.29	8.502E+03	22	42.86	1.421E+02	34	67.35	4.092E-11	46	91.84	9.719E-29
9	16.33	7.391E+03	23	44.90	6.685E+01	35	69.39	1.812E-12	47	93.88	2.046E-30
10	18.37	6.312E+03	24	46.94	2.536E+01	36	71.43	7.742E-14	48	95.92	3.909E-32
11	20.41	5.335E+03	25	48.98	6.624E+00	37	73.47	3.184E-15	49	97.96	6.752E-34
12	22.45	4.456E+03	26	51.02	6.789E-01	38	75.51	1.253E-16	50	100.00	1.049E-35
13	24.49	3.668E+03									
14	26.53	2.967E+03									

•••••••••• TDS CONCENTRATIONS (PPM) ON JAN. 19, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	2.377E+03	27	53.06	4.530E-02	39	77.55	4.668E-18
2	2.04	1.817E+04	16	30.61	1.835E+03	28	55.10	2.680E-03	40	79.59	1.694E-19
3	4.08	1.638E+04	17	32.65	1.374E+03	29	57.14	1.509E-04	41	81.63	5.808E-21
4	6.12	1.467E+04	18	34.69	9.919E+02	30	59.18	8.102E-06	42	83.67	1.867E-22
5	8.16	1.304E+04	19	36.73	6.837E+02	31	61.22	4.161E-07	43	85.71	5.595E-24
6	10.20	1.150E+04	20	38.78	4.446E+02	32	63.26	2.046E-08	44	87.75	1.553E-25
7	12.24	1.007E+04	21	40.82	2.682E+02	33	65.31	9.647E-10	45	89.80	3.969E-27
8	14.29	8.741E+03	22	42.86	1.463E+02	34	67.35	4.365E-11	46	91.84	9.305E-29
9	16.33	7.527E+03	23	44.90	6.933E+01	35	69.39	1.897E-12	47	93.88	1.991E-30
10	18.37	6.421E+03	24	46.94	2.654E+01	36	71.43	7.925E-14	48	95.92	3.874E-32
11	20.41	5.420E+03	25	48.98	7.009E+00	37	73.47	3.181E-15	49	97.96	6.821E-34
12	22.45	4.520E+03	26	51.02	7.281E-01	38	75.51	1.223E-16	50	100.00	1.082E-35
13	24.49	3.716E+03									
14	26.53	3.002E+03									

•••••••••• TDS CONCENTRATIONS (PPM) ON JAN. 20, 1973

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.000E+04	15	28.57	2.407E+03	27	53.06	4.856E-02	39	77.55	4.603E-18
2	2.04	1.821E+04	16	30.61	1.858E+03	28	55.10	2.901E-03	40	79.59	1.636E-19
3	4.08	1.646E+04	17	32.65	1.392E+03	29	57.14	1.647E-04	41	81.63	5.513E-21
4	6.12	1.478E+04	18	34.69	1.006E+03	30	59.18	8.900E-06	42	83.67	1.751E-22
5	8.16	1.317E+04	19	36.73	6.944E+02	31	61.22	4.580E-07	43	85.71	5.212E-24
6	10.20	1.164E+04	20	38.78	4.527E+02	32	63.26	2.248E-08	44	87.75	1.444E-25
7	12.24	1.021E+04	21	40.82	2.741E+02	33	65.31	1.054E-09	45	89.80	3.703E-27
8	14.29	8.879E+03	22	42.86	1.502E+02	34	67.35	4.728E-11	46	91.84	8.737E-29
9	16.33	7.651E+03	23	44.90	7.159E+01	35	69.39	2.029E-12	47	93.88	1.888E-30
10	18.37	6.527E+03	24	46.94	2.761E+01	36	71.43	8.335E-14	48	95.92	3.716E-32
11	20.41	5.507E+03	25	48.98	7.358E+00	37	73.47	3.279E-15	49	97.96	6.635E-34
12	22.45	4.589E+03	26	51.02	7.726E-01	38	75.51	1.234E-16	50	100.00	1.069E-35
13	24.49	3.769E+03									
14	26.53	3.043E+03									

CBOD, NBOD AND DO INPUT CONC. FOR JAN. 16, 1973 THRU JAN. 20, 1973

CBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

NBOD INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0
12	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+01	50	100.00	6.000E+00
13	24.49	0.0									
14	26.53	0.0									

DO INPUT CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	0.0	15	28.57	0.0	27	53.06	0.0	39	77.55	0.0
2	2.04	0.0	16	30.61	0.0	28	55.10	0.0	40	79.59	0.0
3	4.08	0.0	17	32.65	0.0	29	57.14	0.0	41	81.63	0.0
4	6.12	0.0	18	34.69	0.0	30	59.18	0.0	42	83.67	0.0
5	8.16	0.0	19	36.73	0.0	31	61.22	0.0	43	85.71	0.0
6	10.20	0.0	20	38.78	0.0	32	63.26	0.0	44	87.75	0.0
7	12.24	0.0	21	40.82	0.0	33	65.31	0.0	45	89.80	0.0
8	14.29	0.0	22	42.86	0.0	34	67.35	0.0	46	91.84	0.0
9	16.33	0.0	23	44.90	0.0	35	69.39	0.0	47	93.88	0.0
10	18.37	0.0	24	46.94	0.0	36	71.43	0.0	48	95.92	0.0
11	20.41	0.0	25	48.98	0.0	37	73.47	0.0	49	97.96	0.0

	22.45	0.0	26	51.02	0.0	38	75.51	2.000E+00	50	100.00	6.000E+00	
	24.49	0.0										
	26.53	0.0										

AUTOQD - TEST PROBLEM

CBOD, NBOD AND DO CONC FOR THE PERIOD JAN. 16, 1973 THRU JAN. 20, 1973
NUMBER OF DAYS IN THIS PERIOD = 5
TIME STEP IN HOURS = 1.500

CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 16, 1973

CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	4.707E-04	15	28.57	4.792E-03	27	53.06	2.231E-01	39	77.55	1.158E+00
2	2.04	4.827E-04	16	30.61	6.341E-03	28	55.10	2.826E-01	40	79.59	1.320E+00
3	4.08	5.078E-04	17	32.65	8.454E-03	29	57.14	3.566E-01	41	81.63	1.552E+00
4	6.12	5.478E-04	18	34.69	1.135E-02	30	59.18	4.482E-01	42	83.67	1.817E+00
5	8.16	6.055E-04	19	36.73	1.534E-02	31	61.22	5.600E-01	43	85.71	2.119E+00
6	10.20	6.852E-04	20	38.78	2.087E-02	32	63.26	6.939E-01	44	87.75	2.456E+00
7	12.24	7.928E-04	21	40.82	2.860E-02	33	65.31	8.526E-01	45	89.80	2.832E+00
8	14.29	9.369E-04	22	42.86	3.950E-02	34	67.35	1.040E+00	46	91.84	3.246E+00
9	16.33	1.129E-03	23	44.90	5.508E-02	35	69.39	1.265E+00	47	93.88	3.700E+00
10	18.37	1.386E-03	24	46.94	7.769E-02	36	71.43	1.544E+00	48	95.92	4.198E+00
11	20.41	1.730E-03	25	48.98	1.114E-01	37	73.47	1.899E+00	49	97.96	4.743E+00
12	22.45	2.192E-03	26	51.02	1.639E-01	38	75.51	2.335E+00	50	100.00	5.335E+00
13	24.49	2.813E-03									
14	26.53	3.654E-03									

NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.674E-02	15	28.57	7.108E-02	27	53.06	8.727E-01	39	77.55	2.327E+00
2	2.04	1.701E-02	16	30.61	8.550E-02	28	55.10	1.003E+00	40	79.59	2.513E+00
3	4.08	1.755E-02	17	32.65	1.036E-01	29	57.14	1.151E+00	41	81.63	2.758E+00
4	6.12	1.839E-02	18	34.69	1.263E-01	30	59.18	1.319E+00	42	83.67	3.021E+00
5	8.16	1.956E-02	19	36.73	1.548E-01	31	61.22	1.506E+00	43	85.71	3.300E+00
6	10.20	2.109E-02	20	38.78	1.905E-01	32	63.26	1.712E+00	44	87.75	3.593E+00
7	12.24	2.306E-02	21	40.82	2.354E-01	33	65.31	1.934E+00	45	89.80	3.900E+00
8	14.29	2.552E-02	22	42.86	2.919E-01	34	67.35	2.173E+00	46	91.84	4.219E+00
9	16.33	2.859E-02	23	44.90	3.632E-01	35	69.39	2.435E+00	47	93.88	4.549E+00
10	18.37	3.241E-02	24	46.94	4.537E-01	36	71.43	2.731E+00	48	95.92	4.890E+00
11	20.41	3.714E-02	25	48.98	5.703E-01	37	73.47	3.080E+00	49	97.96	5.244E+00
12	22.45	4.304E-02	26	51.02	7.252E-01	38	75.51	3.479E+00	50	100.00	5.609E+00
13	24.49	5.039E-02									
14	26.53	5.958E-02									

DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.545E+00	15	28.57	8.281E+00	27	53.06	5.984E+00	39	77.55	6.382E+00
2	2.04	8.541E+00	16	30.61	8.238E+00	28	55.10	5.812E+00	40	79.59	6.480E+00
3	4.08	8.534E+00	17	32.65	8.187E+00	29	57.14	5.653E+00	41	81.63	6.443E+00
4	6.12	8.524E+00	18	34.69	8.124E+00	30	59.18	5.501E+00	42	83.67	6.385E+00

5	8.16	8.512E+00	19	36.73	8.047E+00	31	61.22	5.363E+00	43	85.71	6.336E+00
6	10.20	8.499E+00	20	38.78	7.951E+00	32	63.26	5.249E+00	44	87.75	6.298E+00
7	12.24	8.482E+00	21	40.82	7.830E+00	33	65.31	5.171E+00	45	89.80	6.271E+00
8	14.29	8.465E+00	22	42.86	7.675E+00	34	67.35	5.136E+00	46	91.84	6.254E+00
9	16.33	8.446E+00	23	44.90	7.472E+00	35	69.39	5.153E+00	47	93.88	6.242E+00
10	18.37	8.425E+00	24	46.94	7.205E+00	36	71.43	5.226E+00	48	95.92	6.224E+00
11	20.41	8.403E+00	25	48.98	6.844E+00	37	73.47	5.371E+00	49	97.96	6.184E+00
12	22.45	8.378E+00	26	51.02	6.343E+00	38	75.51	5.625E+00	50	100.00	6.097E+00
13	24.49	8.350E+00									
14	26.53	8.318E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 17, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.920E-04	15	28.57	4.458E-03	27	53.06	2.203E-01	39	77.55	1.131E+00
2	2.04	4.034E-04	16	30.61	5.899E-03	28	55.10	2.800E-01	40	79.59	1.288E+00
3	4.08	4.272E-04	17	32.65	7.861E-03	29	57.14	3.533E-01	41	81.63	1.517E+00
4	6.12	4.652E-04	18	34.69	1.055E-02	30	59.18	4.431E-01	42	83.67	1.779E+00
5	8.16	5.201E-04	19	36.73	1.425E-02	31	61.22	5.516E-01	43	85.71	2.076E+00
6	10.20	5.960E-04	20	38.78	1.938E-02	32	63.26	6.823E-01	44	87.75	2.410E+00
7	12.24	6.985E-04	21	40.82	2.658E-02	33	65.31	8.407E-01	45	89.80	2.783E+00
8	14.29	8.359E-04	22	42.86	3.679E-02	34	67.35	1.035E+00	46	91.84	3.200E+00
9	16.33	1.019E-03	23	44.90	5.152E-02	35	69.39	1.277E+00	47	93.88	3.663E+00
10	18.37	1.263E-03	24	46.94	7.328E-02	36	71.43	1.575E+00	48	95.92	4.174E+00
11	20.41	1.589E-03	25	48.98	1.066E-01	37	73.47	1.930E+00	49	97.96	4.731E+00
12	22.45	2.025E-03	26	51.02	1.599E-01	38	75.51	2.337E+00	50	100.00	5.332E+00
13	24.49	2.609E-03									
14	26.53	3.396E-03									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.518E-02	15	28.57	6.785E-02	27	53.06	8.663E-01	39	77.55	2.293E+00
2	2.04	1.543E-02	16	30.61	8.175E-02	28	55.10	9.992E-01	40	79.59	2.477E+00
3	4.08	1.594E-02	17	32.65	9.914E-02	29	57.14	1.148E+00	41	81.63	2.721E+00
4	6.12	1.674E-02	18	34.69	1.209E-01	30	59.18	1.314E+00	42	83.67	2.984E+00
5	8.16	1.786E-02	19	36.73	1.482E-01	31	61.22	1.497E+00	43	85.71	3.262E+00
6	10.20	1.934E-02	20	38.78	1.824E-01	32	63.26	1.697E+00	44	87.75	3.554E+00
7	12.24	2.123E-02	21	40.82	2.255E-01	33	65.31	1.917E+00	45	89.80	3.862E+00
8	14.29	2.362E-02	22	42.86	2.798E-01	34	67.35	2.164E+00	46	91.84	4.184E+00
9	16.33	2.660E-02	23	44.90	3.489E-01	35	69.39	2.444E+00	47	93.88	4.521E+00
10	18.37	3.032E-02	24	46.94	4.378E-01	36	71.43	2.761E+00	48	95.92	4.873E+00
11	20.41	3.493E-02	25	48.98	5.547E-01	37	73.47	3.110E+00	49	97.96	5.236E+00
12	22.45	4.067E-02	26	51.02	7.139E-01	38	75.51	3.477E+00	50	100.00	5.608E+00
13	24.49	4.782E-02									
14	26.53	5.673E-02									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.547E+00	15	28.57	8.287E+00	27	53.06	6.047E+00	39	77.55	6.477E+00
2	2.04	8.543E+00	16	30.61	8.245E+00	28	55.10	5.871E+00	40	79.59	6.577E+00
3	4.08	8.536E+00	17	32.65	8.196E+00	29	57.14	5.712E+00	41	81.63	6.540E+00
4	6.12	8.526E+00	18	34.69	8.136E+00	30	59.18	5.563E+00	42	83.67	6.482E+00
5	8.16	8.514E+00	19	36.73	8.062E+00	31	61.22	5.432E+00	43	85.71	6.432E+00
6	10.20	8.500E+00	20	38.78	7.971E+00	32	63.26	5.327E+00	44	87.75	6.392E+00

7	12.24	8.485E+00	21	40.82	7.855E+00	33	65.31	5.252E+00	45	89.80	6.358E+00
8	14.29	8.468E+00	22	42.86	7.707E+00	34	67.35	5.210E+00	46	91.84	6.328E+00
9	16.33	8.449E+00	23	44.90	7.514E+00	35	69.39	5.209E+00	47	93.88	6.296E+00
10	18.37	8.429E+00	24	46.94	7.256E+00	36	71.43	5.265E+00	48	95.92	6.256E+00
11	20.41	8.407E+00	25	48.98	6.905E+00	37	73.47	5.409E+00	49	97.96	6.197E+00
12	22.45	8.382E+00	26	51.02	6.409E+00	38	75.51	5.689E+00	50	100.00	6.101E+00
13	24.49	8.354E+00									
14	26.53	8.323E+00									

•••••••••• CBOD, NBOD AND DO CONCENTRATIONS ON JAN. 18, 1973

•••••••••• CBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	3.312E-04	15	28.57	4.144E-03	27	53.06	2.179E-01	39	77.55	1.106E+00
2	2.04	3.420E-04	16	30.61	5.483E-03	28	55.10	2.770E-01	40	79.59	1.261E+00
3	4.08	3.647E-04	17	32.65	7.306E-03	29	57.14	3.490E-01	41	81.63	1.487E+00
4	6.12	4.008E-04	18	34.69	9.802E-03	30	59.18	4.371E-01	42	83.67	1.747E+00
5	8.16	4.530E-04	19	36.73	1.325E-02	31	61.22	5.449E-01	43	85.71	2.043E+00
6	10.20	5.252E-04	20	38.78	1.805E-02	32	63.26	6.776E-01	44	87.75	2.378E+00
7	12.24	6.227E-04	21	40.82	2.481E-02	33	65.31	8.420E-01	45	89.80	2.757E+00
8	14.29	7.530E-04	22	42.86	3.451E-02	34	67.35	1.045E+00	46	91.84	3.181E+00
9	16.33	9.265E-04	23	44.90	4.871E-02	35	69.39	1.292E+00	47	93.88	3.652E+00
10	18.37	1.157E-03	24	46.94	7.009E-02	36	71.43	1.585E+00	48	95.92	4.169E+00
11	20.41	1.464E-03	25	48.98	1.034E-01	37	73.47	1.927E+00	49	97.96	4.730E+00
12	22.45	1.873E-03	26	51.02	1.573E-01	38	75.51	2.321E+00	50	100.00	5.332E+00
13	24.49	2.420E-03									
14	26.53	3.155E-03									

•••••••••• NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.380E-02	15	28.57	6.478E-02	27	53.06	8.619E-01	39	77.55	2.263E+00
2	2.04	1.404E-02	16	30.61	7.816E-02	28	55.10	9.950E-01	40	79.59	2.445E+00
3	4.08	1.454E-02	17	32.65	9.487E-02	29	57.14	1.142E+00	41	81.63	2.690E+00
4	6.12	1.531E-02	18	34.69	1.158E-01	30	59.18	1.306E+00	42	83.67	2.952E+00
5	8.16	1.638E-02	19	36.73	1.420E-01	31	61.22	1.487E+00	43	85.71	3.231E+00
6	10.20	1.781E-02	20	38.78	1.749E-01	32	63.26	1.688E+00	44	87.75	3.526E+00
7	12.24	1.964E-02	21	40.82	2.164E-01	33	65.31	1.915E+00	45	89.80	3.839E+00
8	14.29	2.196E-02	22	42.86	2.691E-01	34	67.35	2.172E+00	46	91.84	4.168E+00
9	16.33	2.486E-02	23	44.90	3.368E-01	35	69.39	2.458E+00	47	93.88	4.512E+00
10	18.37	2.846E-02	24	46.94	4.253E-01	36	71.43	2.771E+00	48	95.92	4.869E+00
11	20.41	3.295E-02	25	48.98	5.438E-01	37	73.47	3.104E+00	49	97.96	5.235E+00
12	22.45	3.852E-02	26	51.02	7.068E-01	38	75.51	3.456E+00	50	100.00	5.607E+00
13	24.49	4.544E-02									
14	26.53	5.405E-02									

•••••••••• DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.[illegible]9E+00	15	28.57	8.293E+00	27	53.06	6.097E+00	39	77.55	6.546E+00
2	2.04	8.5[illegible]5E+00	16	30.61	8.253E+00	28	55.10	5.921E+00	40	79.59	6.645E+00
3	4.08	8.5[illegible]8E+00	17	32.65	8.205E+00	29	57.14	5.764E+00	41	81.63	6.604E+00
4	6.12	8.5[illegible]8E+00	18	34.69	8.147E+00	30	59.18	5.620E+00	42	83.67	6.542E+00
5	8.16	8.51[illegible]+00	19	36.73	8.076E+00	31	61.22	5.493E+00	43	85.71	6.486E+00
6	10.20	8.50[illegible]+00	20	38.78	7.989E+00	32	63.26	5.386E+00	44	87.75	6.436E+00
7	12.24	8.487E+00	21	40.82	7.878E+00	33	65.31	5.302E+00	45	89.80	6.391E+00
8	14.29	8.470E+00	22	42.86	7.736E+00	34	67.35	5.247E+00	46	91.84	6.348E+00

9	[illegible]	8.452E+00	23	44.90	7.550E+00	35	69.39	5.237E+00	47	93.88	6.306E+00
10	[illegible]	8.432E+00	24	46.94	7.299E+00	36	71.43	5.297E+00	48	95.92	6.260E+00
11	[illegible]	8.410E+00	25	48.98	6.953E+00	37	73.47	5.456E+00	49	97.96	6.198E+00
12	[illegible]	8.386E+00	26	51.02	6.461E+00	38	75.51	5.748E+00	50	100.00	6.101E+00
13	[illegible]	8.359E+00									
14	[illegible]	8.328E+00									

********** CHOD, NBOD AND DO CONCENTRATIONS ON JAN. 19, 1973

.... CHOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.839E-04	15	28.57	3.851E-03	27	53.06	2.153E-01	39	77.55	1.085E+00
2	2.04	2.942E-04	16	30.61	5.098E-03	28	55.10	2.737E-01	40	79.59	1.238E+00
3	4.08	3.157E-04	17	32.65	6.796E-03	29	57.14	3.451E-01	41	81.63	1.463E+00
4	6.12	3.500E-04	18	34.69	9.127E-03	30	59.18	4.335E-01	42	83.67	1.724E+00
5	8.16	3.995E-04	19	36.73	1.236E-02	31	61.22	5.433E-01	43	85.71	2.023E+00
6	10.20	4.679E-04	20	38.78	1.689E-02	32	63.26	6.796E-01	44	87.75	2.363E+00
7	12.24	5.602E-04	21	40.82	2.334E-02	33	65.31	8.476E-01	45	89.80	2.747E+00
8	14.29	6.833E-04	22	42.86	3.270E-02	34	67.35	1.052E+00	46	91.84	3.176E+00
9	16.33	8.468E-04	23	44.90	4.660E-02	35	69.39	1.295E+00	47	93.88	3.650E+00
10	18.37	1.064E-03	24	46.94	6.783E-02	36	71.43	1.581E+00	48	95.92	4.168E+00
11	20.41	1.351E-03	25	48.98	1.012E-01	37	73.47	1.915E+00	49	97.96	4.730E+00
12	22.45	1.734E-03	26	51.02	1.552E-01	38	75.51	2.305E+00	50	100.00	5.332E+00
13	24.49	2.245E-03									
14	26.53	2.930E-03									

.... NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.250E-02	15	28.57	6.188E-02	27	53.06	8.576E-01	39	77.55	2.236E+00
2	2.04	1.283E-02	16	30.61	7.475E-02	28	55.10	9.899E-01	40	79.59	2.419E+00
3	4.08	1.351E-02	17	32.65	9.081E-02	29	57.14	1.136E+00	41	81.63	2.664E+00
4	6.12	1.465E-02	18	34.69	1.109E-01	30	59.18	1.299E+00	42	83.67	2.929E+00
5	8.16	1.629E-02	19	36.73	1.361E-01	31	61.22	1.482E+00	43	85.71	3.211E+00
6	10.20	1.847E-02	20	38.78	1.679E-01	32	63.26	1.688E+00	44	87.75	3.512E+00
7	12.24	1.[illegible]E-02	21	40.82	2.082E-01	33	65.31	1.920E+00	45	89.80	3.830E+00
8	14.29	2.[illegible]E-02	22	42.86	2.599E-01	34	67.35	2.178E+00	46	91.84	4.163E+00
9	16.33	2.[illegible]E-02	23	44.90	3.271E-01	35	69.39	2.460E+00	47	93.88	4.510E+00
10	18.37	2.[illegible]E-02	24	46.94	4.159E-01	36	71.43	2.763E+00	48	95.92	4.868E+00
11	20.41	3.[illegible]E-02	25	48.98	5.360E-01	37	73.47	3.087E+00	49	97.96	5.235E+00
12	22.45	3.[illegible]E-02	26	51.02	7.017E-01	38	75.51	3.434E+00	50	100.00	5.607E+00
13	24.49	4.[illegible]E-02									
14	26.53	5.[illegible]E-02									

.... DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.551E+00	15	28.57	8.299E+00	27	53.06	6.140E+00	39	77.55	6.594E+00
2	2.04	8.547E+00	16	30.61	8.259E+00	28	55.10	5.966E+00	40	79.59	6.690E+00
3	4.08	8.540E+00	17	32.65	8.213E+00	29	57.14	5.810E+00	41	81.63	6.644E+00
4	6.12	8.530E+00	18	34.69	8.157E+00	30	59.18	5.666E+00	42	83.67	6.575E+00
5	8.16	8.518E+00	19	36.73	8.090E+00	31	61.22	5.536E+00	43	85.71	6.511E+00
6	10.20	8.505E+00	20	38.78	8.006E+00	32	63.26	5.421E+00	44	87.75	6.453E+00
7	12.24	8.489E+00	21	40.82	7.899E+00	33	65.31	5.328E+00	45	89.80	6.400E+00
8	14.29	8.473E+00	22	42.86	7.762E+00	34	67.35	5.270E+00	46	91.84	6.353E+00
9	16.33	8.454E+00	23	44.90	7.580E+00	35	69.39	5.264E+00	47	93.88	6.308E+00
10	18.37	8.435E+00	24	46.94	7.334E+00	36	71.43	5.332E+00	48	95.92	6.260E+00

11	[illegible]	8.413E+00	25	48.98	6.992E+00	37	73.47	5.499E+00	49	97.96	6.198E+00
12	[illegible]	8.389E+00	26	51.02	6.502E+00	38	75.51	5.794E+00	50	100.00	6.101E+00
13	[illegible]	8.362E+00									
14	26.53	8.333E+00									

********** CHOD, NBOD AND DO CONCENTRATIONS ON JAN. 20, 1973

********** CHOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	2.466E-04	15	28.57	3.582E-03	27	53.06	2.131E-01	39	77.55	1.068E+00
2	2.04	2.564E-04	16	30.61	4.747E-03	28	55.10	2.713E-01	40	79.59	1.222E+00
3	4.08	2.768E-04	17	32.65	6.338E-03	29	57.14	3.432E-01	41	81.63	1.449E+00
4	6.12	3.092E-04	18	34.69	8.533E-03	30	59.18	4.330E-01	42	83.67	1.713E+00
5	8.16	3.561E-04	19	36.73	1.159E-02	31	61.22	5.448E-01	43	85.71	2.015E+00
6	10.20	4.207E-04	20	38.78	1.593E-02	32	63.26	6.826E-01	44	87.75	2.359E+00
7	12.24	5.076E-04	21	40.82	2.216E-02	33	65.31	8.502E-01	45	89.80	2.744E+00
8	14.29	6.245E-04	22	42.86	3.131E-02	34	67.35	1.051E+00	46	91.84	3.175E+00
9	16.33	7.770E-04	23	44.90	4.505E-02	35	69.39	1.290E+00	47	93.88	3.650E+00
10	18.37	9.802E-04	24	46.94	6.619E-02	36	71.43	1.572E+00	48	95.92	4.168E+00
11	20.41	1.249E-03	25	48.98	9.953E-02	37	73.47	1.903E+00	49	97.96	4.730E+00
12	22.45	1.607E-03	26	51.02	1.533E-01	38	75.51	2.290E+00	50	100.00	5.332E+00
13	24.49	2.086E-03									
14	26.53	2.722E-03									

********** NBOD CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	1.154E-02	15	28.57	5.914E-02	27	53.06	8.532E-01	39	77.55	2.215E+00
2	2.04	1.177E-02	16	30.61	7.153E-02	28	55.10	9.850E-01	40	79.59	2.399E+00
3	4.08	1.223E-02	17	32.65	8.700E-02	29	57.14	1.131E+00	41	81.63	2.647E+00
4	6.12	1.295E-02	18	34.69	1.064E-01	30	59.18	1.296E+00	42	83.67	2.915E+00
5	8.16	1.396E-02	19	36.73	1.308E-01	31	61.22	1.482E+00	43	85.71	3.202E+00
6	10.20	1.530E-02	20	38.78	1.617E-01	32	63.26	1.691E+00	44	87.75	3.506E+00
7	12.24	1.702E-02	21	40.82	2.012E-01	33	65.31	1.923E+00	45	89.80	3.827E+00
8	14.29	1.920E-02	22	42.86	2.523E-01	34	67.35	2.177E+00	46	91.84	4.162E+00
9	16.33	2.192E-02	23	44.90	3.193E-01	35	69.39	2.452E+00	47	93.88	4.510E+00
10	18.37	2.530E-02	24	46.94	4.088E-01	36	71.43	2.749E+00	48	95.92	4.868E+00
11	20.41	2.951E-02	25	48.98	5.303E-01	37	73.47	3.069E+00	49	97.96	5.235E+00
12	22.45	3.472E-02	26	51.02	6.974E-01	38	75.51	3.414E+00	50	100.00	5.607E+00
13	24.49	4.117E-02									
14	26.53	4.918E-02									

********** DO CONCENTRATIONS (PPM)

JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE	JUNC NO	RIVER MILE	VALUE
1	0.0	8.55[illegible]+00	15	28.57	8.304E+00	27	53.06	6.177E+00	39	77.55	6.627E+00
2	2.04	8.549E+00	16	30.61	8.266E+00	28	55.10	6.003E+00	40	79.59	6.718E+00
3	4.08	8.542E+00	17	32.65	8.221E+00	29	57.14	5.846E+00	41	81.63	6.666E+00
4	6.12	8.532E+00	18	34.69	8.167E+00	30	59.18	5.698E+00	42	83.67	6.591E+00
5	8.16	8.520E+00	19	36.73	8.102E+00	31	61.22	5.562E+00	43	85.71	6.521E+00
6	10.20	8.507E+00	20	38.78	8.020E+00	32	63.26	5.441E+00	44	87.75	6.458E+00
7	12.24	8.491E+00	21	40.82	7.917E+00	33	65.31	5.347E+00	45	89.80	6.403E+00
8	14.29	8.475E+00	22	42.86	7.783E+00	34	67.35	5.291E+00	46	91.84	6.354E+00
9	16.33	8.457E+00	23	44.90	7.605E+00	35	69.39	5.291E+00	47	93.88	6.308E+00
10	18.37	8.437E+00	24	46.94	7.362E+00	36	71.43	5.365E+00	48	95.92	6.260E+00
11	20.41	8.415E+00	25	48.98	7.023E+00	37	73.47	5.534E+00	49	97.96	6.198E+00
12	22.45	8.392E+00	26	51.02	6.537E+00	38	75.51	5.828E+00	50	100.00	6.101E+00

13	24.49	8.366E+00
14	24.53	8.337E+00

APPENDIX C

APPLICATION, CALIBRATION, VERIFICATION, AND SENSITIVITY

In the past much effort was spent in the planning effort evaluating alternative water qaulity management schemes. It was this type of analysis that stimulated the use and growth of mathematical techniques. Little or no effort was spent determining the reliability of the individual models in predicting absolutes.

It was then considered that the ability of a model to reproduce nature was secondary to its ability to predict differences between alternatives consistently. Considering the defined problems of that time, it was certainly proper to take that viewpoint.

Since that time, water quality standards have been introduced. These standards are absolutes in terms of defined quantities of that may be present in the receiving waters. Plans and proposals must now be weighed not only against each other but ultimately against the "standards". Plans which will not allow the receiving water quality to be at or above standards must be rejected as infeasible on the basis of standards.

The introduction of water quality standards, and the civil and criminal penalties for their violation, adds a new dimension to mathematical modelling for water quality planning. The model user must now be concerned with the accuracy of a technique as well as its consistency.

MODEL CALIBRATION:

There are constants and coefficients of functions inherent in the AUTØ-QUAL set that can not be directly determined or measured. For example, there are no methods for making direct field measurements of dispersion coefficients (E). The reader may recognize these quantites as being:

1. Dispersion coefficients (E)
2. CBOD decay rate (K_C)
3. NBOD decay rate (K_N)
4. Reaeration rate (K_2).

While techniques exist for the determination of K_C and K_N, the wide range of values obtained in the tests of the replicate samples preclude considering K_C and K_N as "knowns". Similarly, field measurements for the determination of the reaeration rate (K_2) show a wide range of values. The Dobbin's - O'Connor formula is currently the most common function used, and as such it is considered to be the standard form.

Dispersion is probably the most obvious calibration coefficient in the above group. The elimination of tidal effects in the flow computations demands that some mechanism be incorporated in the model to represent the smearing of the quality profiles by the tides (See Model Development).

Those inputs to the model that can be directly measured or determined with good reliability are considered as knowns. Since the calibration process consists of matching a predicted profile (or profiles) to an observed profile by means of adjusting

the calibration constants. Any errors in the knowns will be incorporated into the calibration constants.

The primary knowns and their sources are:

1. Flow - from streamflow gages operated by State or Federal agencies or direct field measurements.
2. A_1, A_2, A_3 - from stage/discharge records maintained by State or Federal agencies or direct field measurements.
3. A_3 (in estuaries) - nautical charts or field measurements.
4. Widths - charts, maps or direct measurements.
5. Q_{out} (amount and location) - diversion records.
6. Q_{in} (amount and location) - waste water records or direct measurement (direct measurement is preferable)
7. Water temperature - direct field measurements or existing records.
8. Tidal velocities - current tables or direct measurements.
9. Sediment uptake of oxygen rate - direct measurements or existing records.
10. Photosynthesis-Respiration rate - direct field measurements or existing records.

Where field measurements are indicated, they must be made at the same times as the observed profiles. To do otherwise is to assume that those inputs are in fact constant. The above list may, of course, be tailored to the particuliar constituents under considerartion.

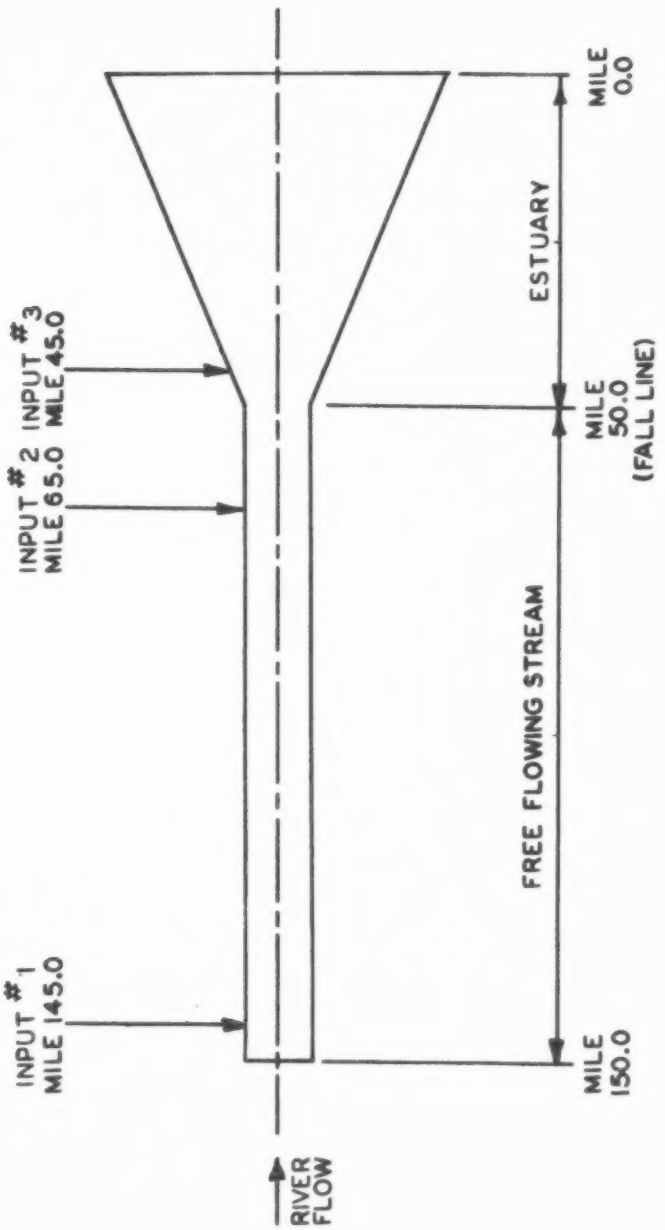
SENSITIVITY:

The following figures illustrate the sensitivity of the AUTØ-QUAL set to normal variations in the magnitudes of the important varibles. The reader should study the figures and experiment with his own systems to get a better feeling for the effects of the different factors.

AUTØSS was generally used to compute the sensitivity profiles. The effects are identical in AUTØQD. Figure C16 shows the convergence of the AUTØQD solution, over time, to the AUTØSS solution. Since natural streamflow and waste sources are rarely constant for the period of time required for a body of water to reach a steady state condition in water quality, AUTØQD should be used in the calibration process. The calibration coefficients can then be transferred to AUTØSS for the planning runs.

FIGURE C1

SCHEMATIC DIAGRAM OF ESTUARY/STREAM
USED IN SENSITIVITY ANALYSES



The following data values were assigned to the example stream/estuary system:

Mile of upstream end	150.0
Mile of downstream end	0.0
Mile of fall line	50.0
Number of sections	150

PHYSICAL DATA;

A_1;

Miles 0.0 thru 48.0	A_1=0.0
@ mile 50.0	A_1=0.040
@ mile 150.0	A_1=0.025

A_2;

Miles 0.0 thru 48.0	A_2=0.0
@ mile 50.0	A_2=0.6
Miles 50.0 thru 150.0	A_2=0.6

A_3;

@ mile 0.0	A_3=20.0
@ mile 50.0	A_3=10.0
Miles 50.1 thru 150.0	A_3=0.0

Widths;

@ mile 0.0	Width=21200.0 ft.
@ mile 50.0	Width=1000.0 ft.
Miles 50.0 thru 150.0	Width=1000.0 ft.

Tidal Velocities;

@ mile 0.0	V_t=1.2 fps
@ mile 25.0	V_t=0.8 fps
@ mile 50.0	V_t=0.6 fps
Miles 50.1 thru 150.0	V_t=0.0 fps

Dispersion Coefficients;

@ mile 0.0	E=5000.0 ft^2/sec
@ mile 10.0	E=4300.0 ft^2/sec
@ mile 20.0	E=3500.0 ft^2/sec
@ mile 30.0	E=2200.0 ft^2/sec

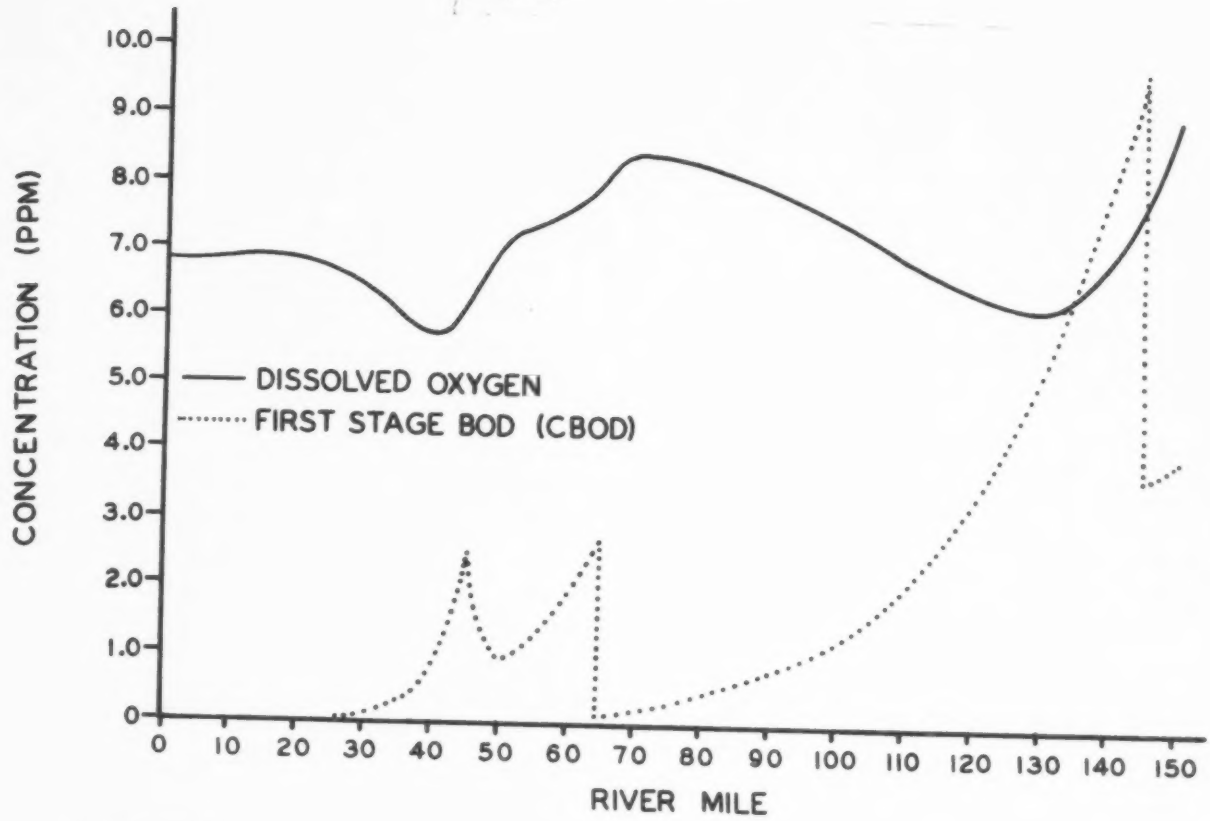
@ mile 40.0	E=1200.0 ft^2/sec
@ mile 50.0	E=400.0 ft^2/sec
@ mile 55.0	E=100.0 ft^2/sec
Miles 55.0 thru 150.0	E=100.0 ft^2/sec

When point values are specified, the program will interpolate linearly between the points for intermediate values.

These values will remain the same for all the runs on the example stream/estuary, except where changes are specified. The other inputs are specified for each run.

FIGURE C2

EXAMPLE RUN WITH ONLY CBOD INPUTS
(AUTØSS)



INPUT DATA:

TEMPERATURES:
@ mile 0.0 T=28.0°C
@ mile 25.0 T=25.0°C
@ mile 75.0 T=20.0°C
Miles 75.0 thru 150.0 T=20.0°C

CBOD DECAY RATE = 0.23(1/day)

NBOD DECAY RATE = 0.103(1/day)

SEDIMENT UPTAKE;
Miles 0.0 thru 20.0 Sedmt=1.0($gr.O_2/m^2$/day)
@ mile 45.0 Sedmt=2.0($gr.O_2/m^2$/day)
@ mile 66.0 Sedmt=0.0($gr.O_2/m^2$/day)
Miles 66.0 thru 150.0 Sedmt=0.0($gr.O_2/m^2$/day)

PHOTOSYNTHESIS-RESPIRATION RATES
Miles 0.0 thru 30.0 P-R =-0.2($gr.O_2/m^2$/day)
@ mile 35.0 P-R =-1.0($gr.O_2/m^2$/day)
@ mile 50.0 P-R = 0.0($gr.O_2/m^2$/day)
Miles 50.0 thru 150.0 P-R = 0.0($gr.O_2/m^2$/day)

COMPUTED REAERATION RATES

COMPUTED OXYGEN SATURATION CONCENTRATIONS

INFLOW DATA:

@ mile 150.0
2000.0 cfs @4.0ppm CBOD &
9.0ppm DO

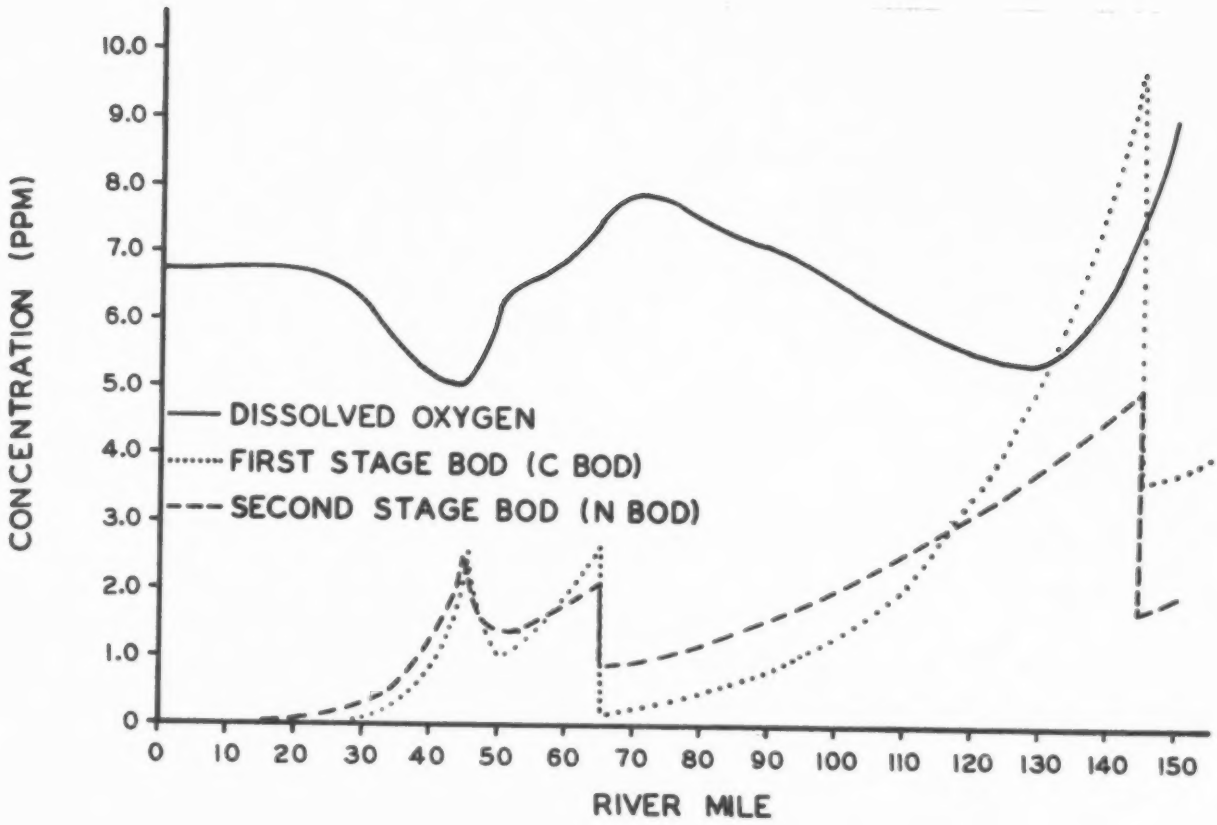
@ mile 145.0
150.0 cfs @100.0ppm CBOD &
0.0ppm DO

@ mile 65.0
50.0 cfs @120.0ppm CBOD &
0.0ppm DO

@ mile 45.0
200.0 cfs @50.0ppm CBOD &
0.0ppm DO

FIGURE C3

EXAMPLE RUN WITH CBOD AND NBOD INPUTS
(AUTØSS)



SAME INPUT DATA AS FIGURE C2 WITH THE FOLLOWING INFLOWS:

@ mile 150.0
2000.0 cfs @4.0ppm CBOD & 2.0ppm NBOD & 9.0ppm DO

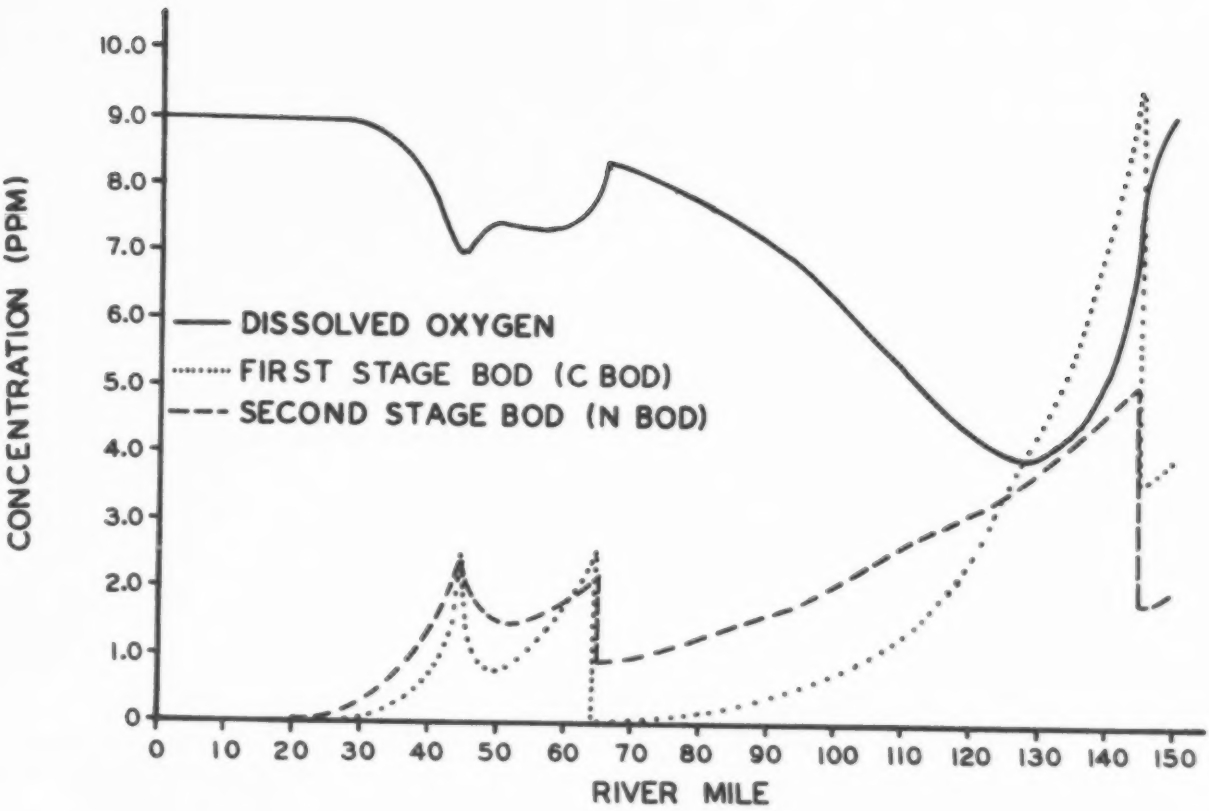
@ mile 145.0
150.0 cfs @100.0ppm CBOD & 50.0ppm NBOD & 0.0ppm DO

@ mile 65.0
50.0 cfs @120.0ppm CBOD & 60.0ppm NBOD & 0.0ppm DO

@ mile 45.0
200.0 cfs @50.0ppm CBOD & 30.0ppm NBOD & 0.0ppm DO

FIGURE C4

BASE CONDITION FOR SENSITIVITY RUNS
(AUTØSS)



INPUT DATA:

TEMPERATURE = 20.0°C

CBOD DECAY RATE = 0.30(1/day)

NBOD DECAY RATE = 0.10(1/day)

SEDIMENT UPTAKE = 0.0 ($gr.O_2/m^2/day$)

(P-R) = 0.0 ($gr.O_2/m^2/day$)

REAERATION RATE = 0.30(1/day)

COMPUTED OXYGEN SATURATION CONCENTRATIONS

OTHER INPUT DATA IS THE SAME AS FIGURE C2

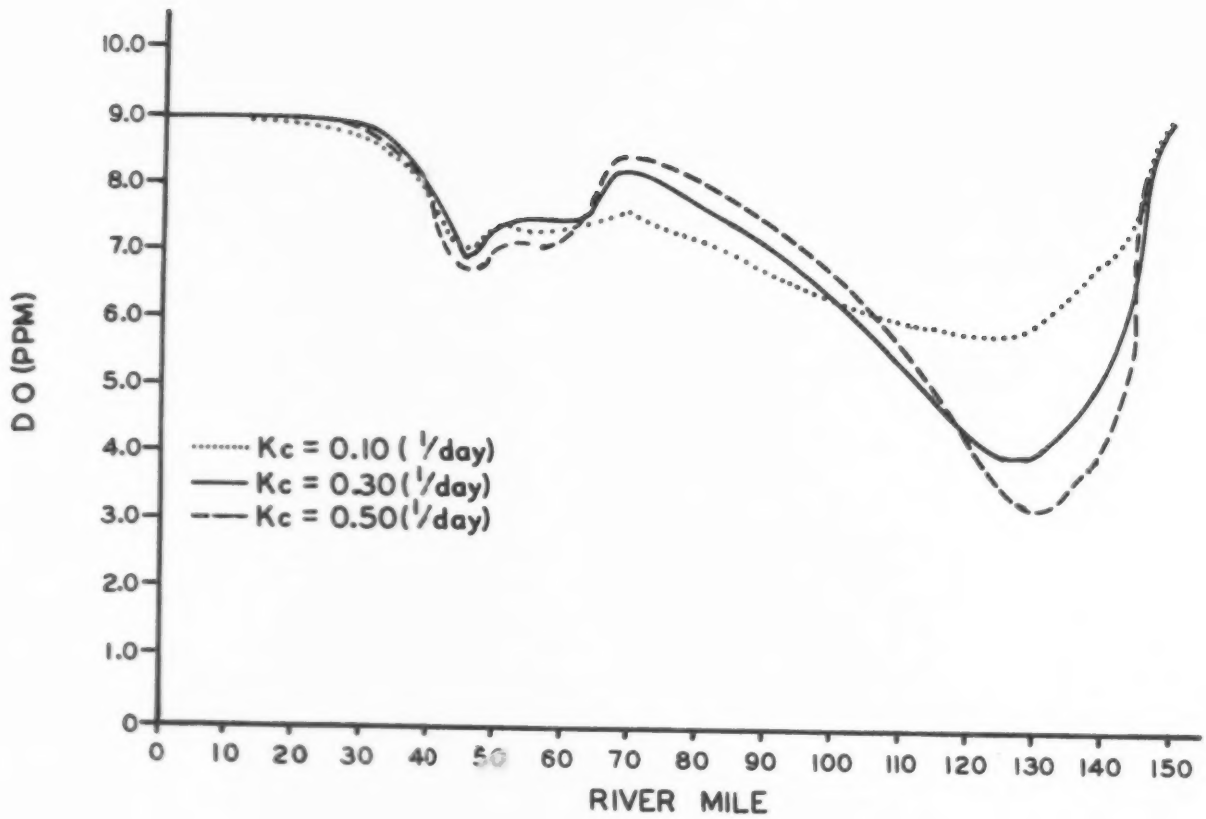
INFLOW DATA:

SAME AS FIGURE C3

FIGURE C5

EFFECT OF CBOD DECAY RATE (K_c)

(AUTØSS)

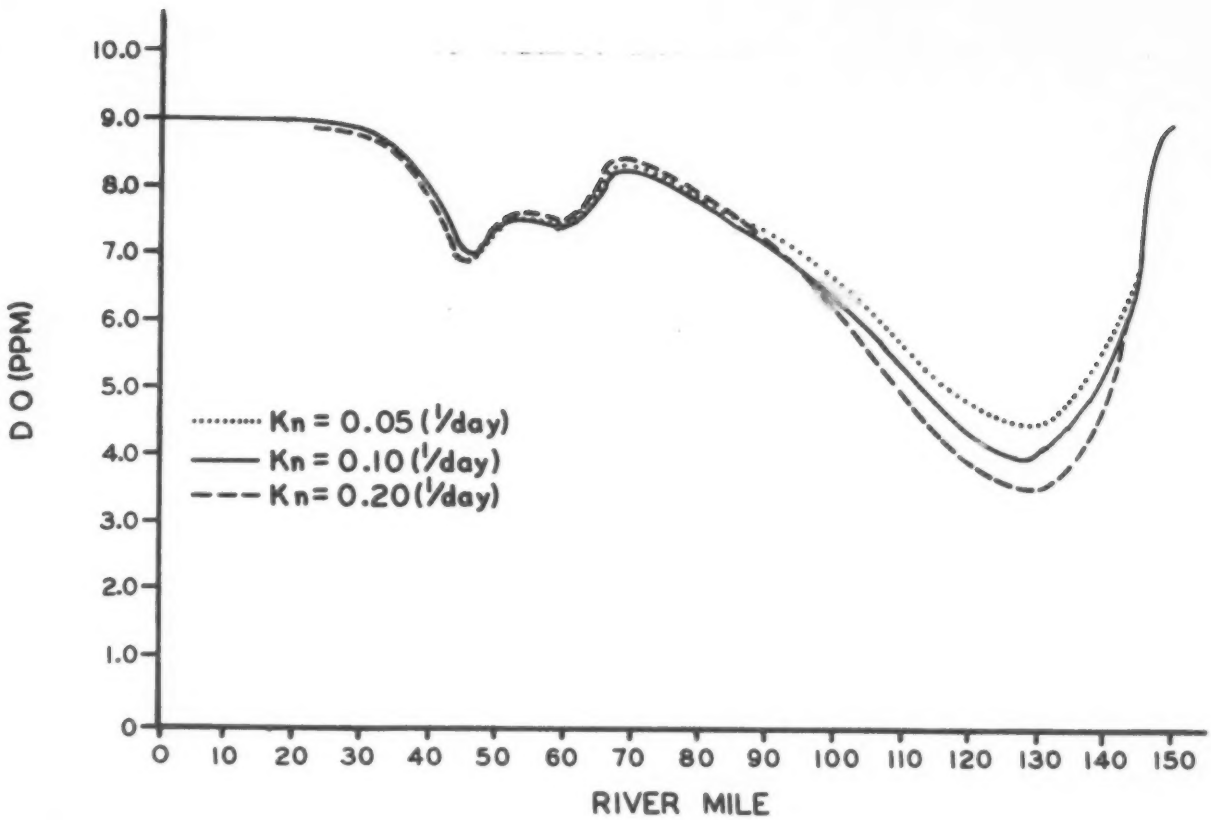


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4,
EXCEPT THE CBØD DECAY RATE HAS BEEN VARIED

FIGURE C6

EFFECT OF NBØD DECAY RATE (K_n)

(AUTØSS)

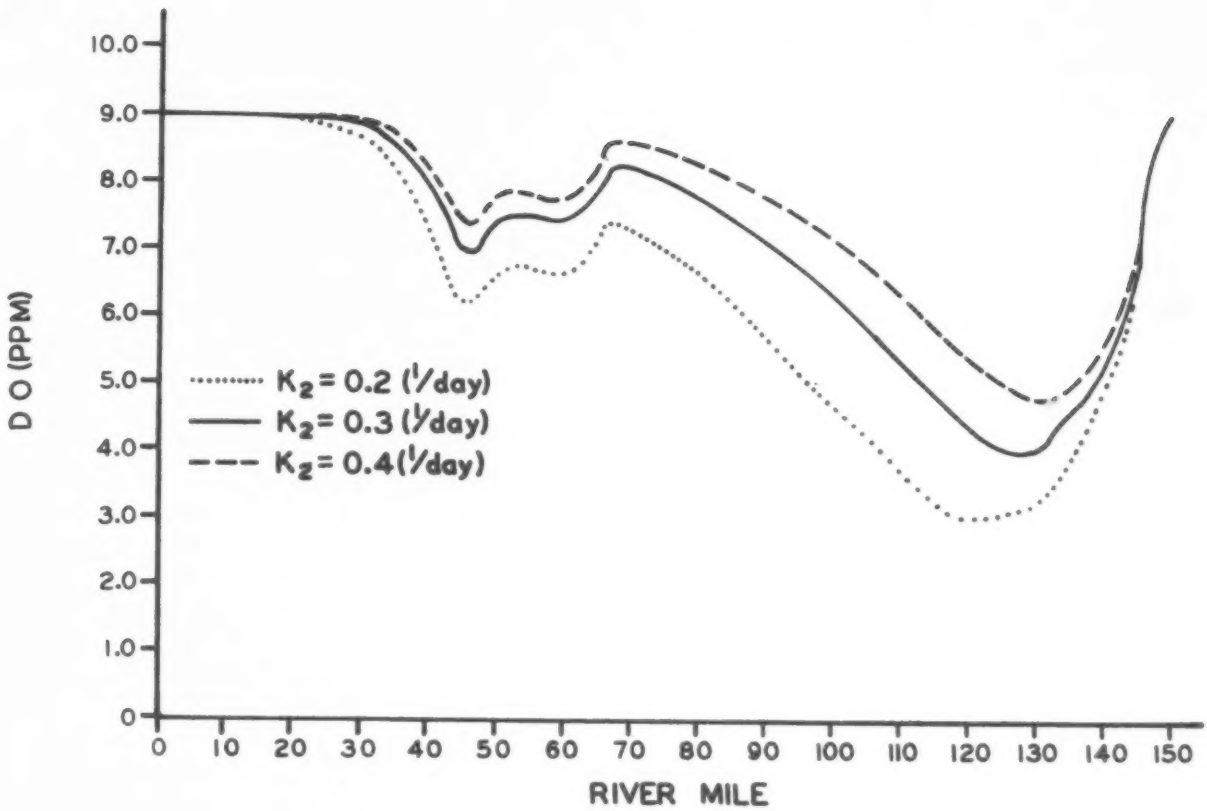


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4,
EXCEPT THE NBØD DECAY RATE HAS BEEN VARIED

FIGURE C7

EFFECT OF REAERATION RATE (K_2)

(AUTØSS)

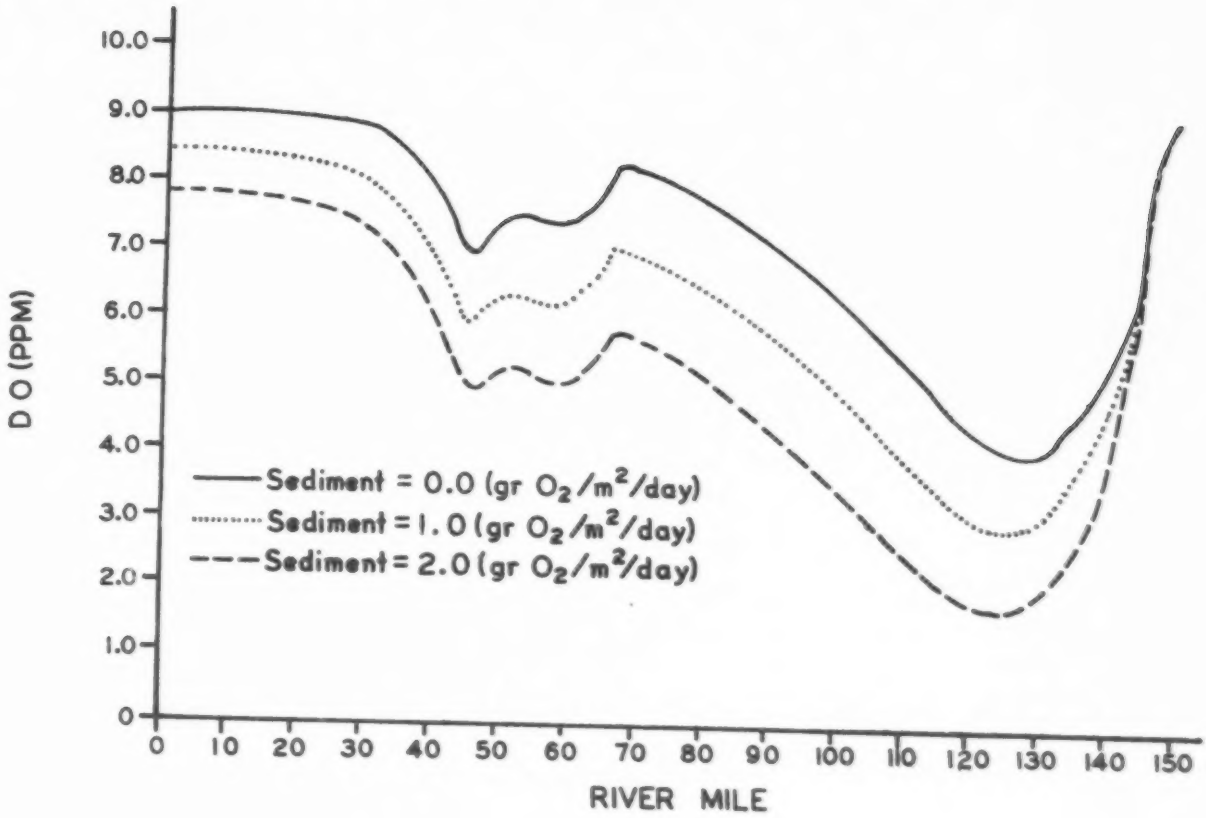


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4,
EXCEPT THE REAERATION RATE HAS BEEN VARIED

FIGURE C8

EFFECT OF SEDIMENT UPTAKE

(AUTØSS)

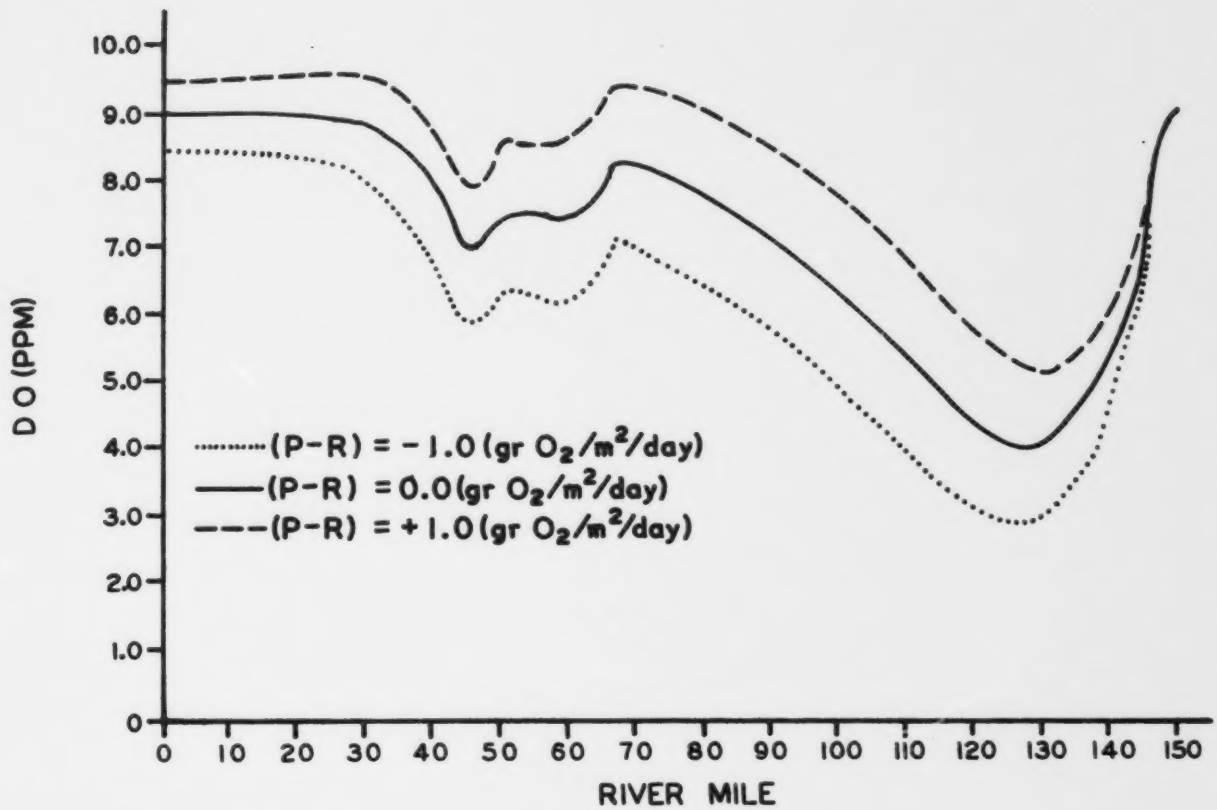


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C5,
EXCEPT THE SEDIMENT UPTAKE HAS BEEN VARIED

FIGURE C9

EFFECT OF PHOTOSYNTHESIS - RESPIRATION RATE

(AUTØSS)

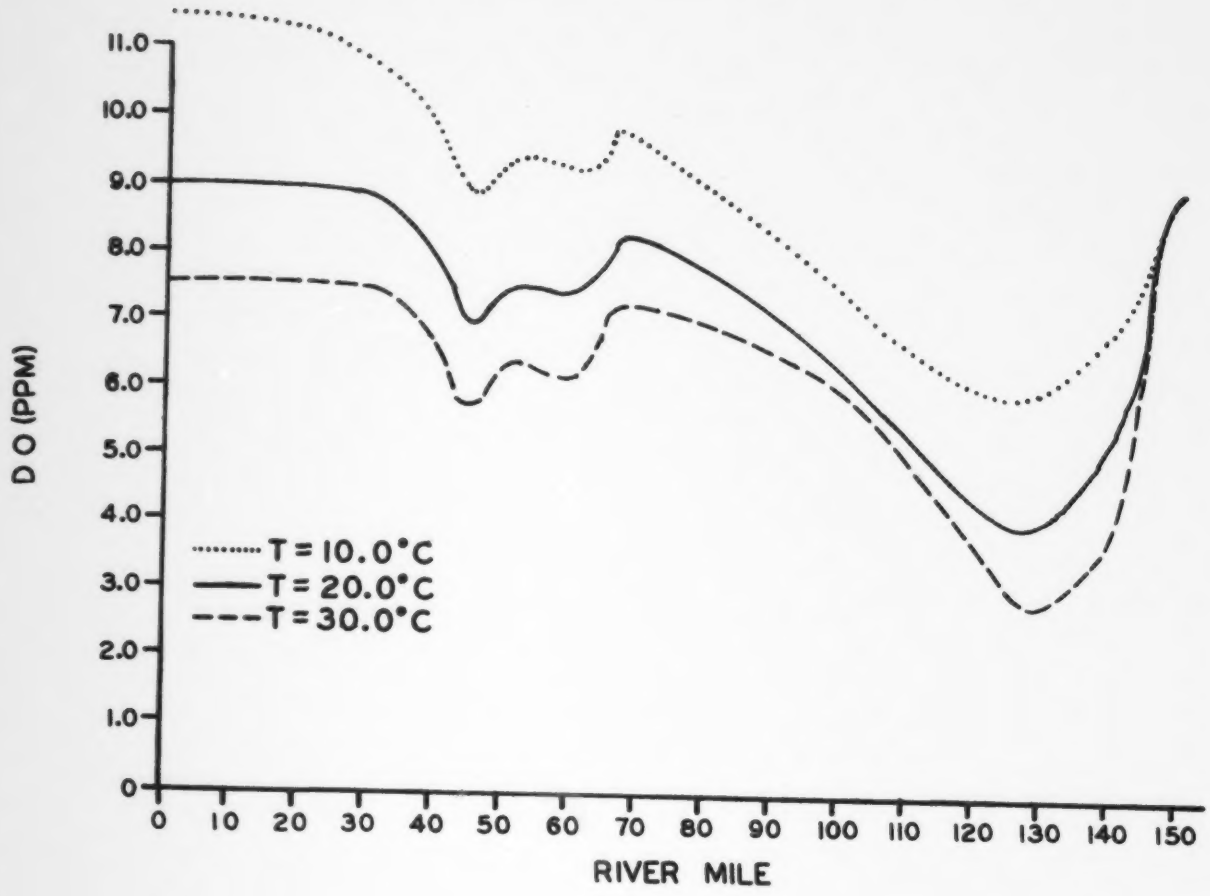


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4,
EXCEPT THE PHOTOSYNTHESIS-RESPIRATION RATE HAS BEEN VARIED

FIGURE C10

EFFECT OF TEMPERATURE

(AUTØSS)



INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4,
EXCEPT THE STREAM TEMPERATURE HAS BEEN VARIED

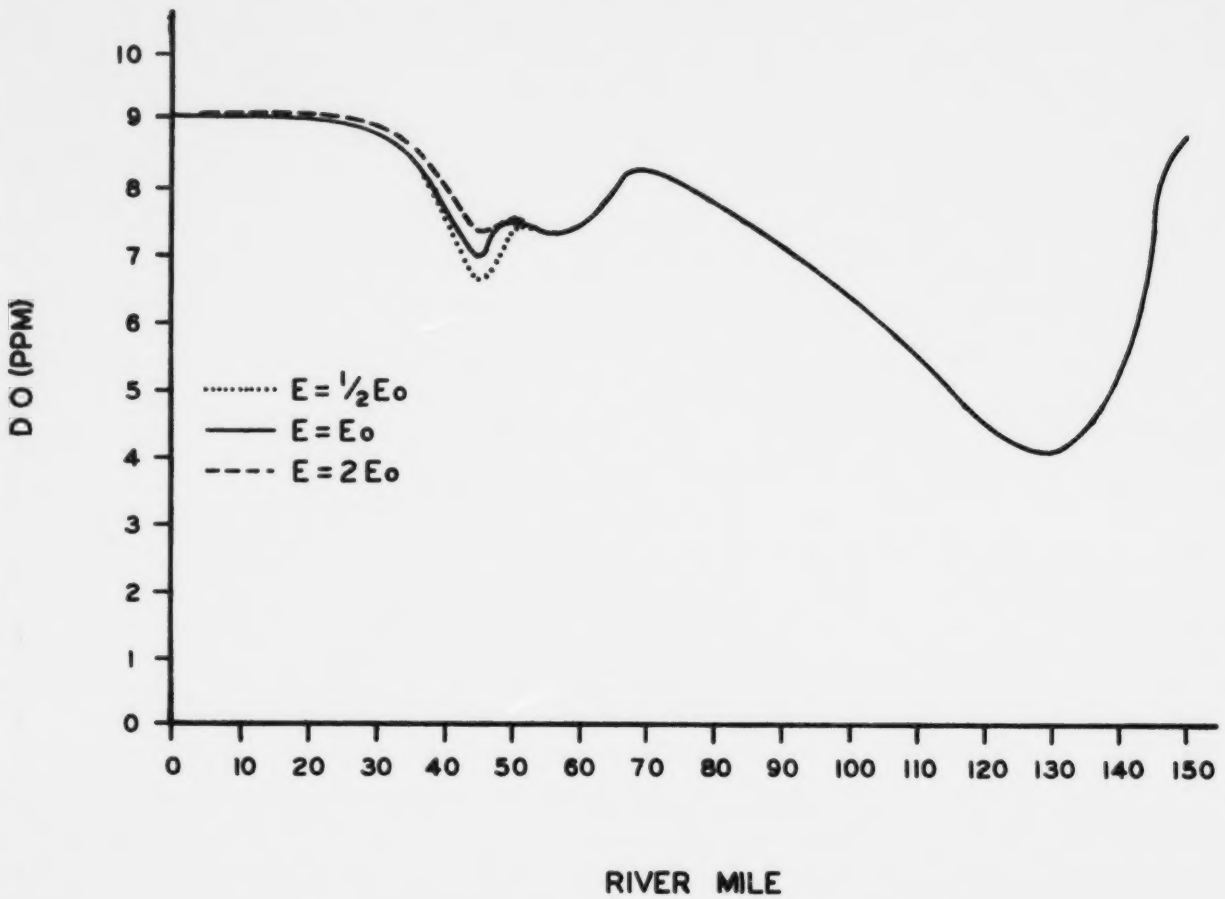
Note:

D.Ø. Saturation Concentrations @ 10°C = 11.4 ppm
@ 20°C = 9.08 ppm
@ 30°C = 7.52 ppm

FIGURE C11

EFFECT OF DISPERSION COEFFICIENT

(AUTØSS)

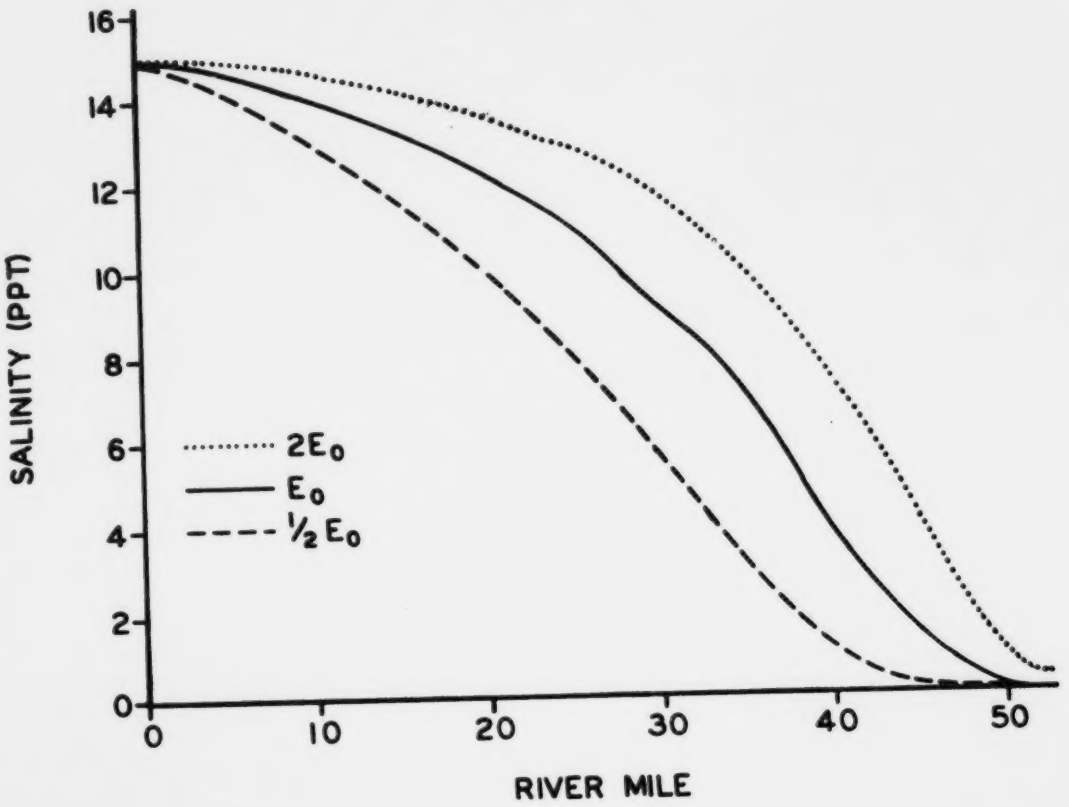


INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4, EXCEPT THE DISPERSION COEFFICIENTS (E) HAVE BEEN VARIED. E_o ARE THE DISPERSION COEFFICIENTS SPECIFIED IN FIGURE C4.

FIGURE C12

EFFECT OF DISPERSION COEFFICIENT

(AUTØSS)



INPUT AND INFLØW DATA IS THE SAME AS FOR FIGURE C4, EXCEPT SALINITY IS BEING RUN WITH THE DOWNSTREAM END FIXED AT 15000 ppm. THE DISPERSION COEFFICIENTS ARE VARIED AS SHOWN WHERE E_o ARE THE DISPERSION COEFFICIENTS SPECIFIED IN FIGURE C4. ONLY THE ESTUARY PORTION IS SHOWN BECAUSE THE SALINITY CONCENTRATIONS WERE NEGLIGIBLE IN THE FREE FLOWING SECTION.

To demonstrate the use of AUTØQD a run was made on the same hypothetical stream/estuary that was used for the AUTØSS examples. A hypothetical hydrograph and downstream boundry condition (salinity concentration) were chosen for this example (see Figure C13). Notice that the hydrograph and the downstream concentration are represented in a stairstep fashion.

The same general input data used in AUTØSS has been used for AUTØQD. A steady state solution (AUTØSS) for the 2000.0 cfs flow condition was used for starting concentrations. A time step of 1 hour was specified for the run. Figures C14 & C15 show the results of the model run, only the estuary portion was shown because the salinity concentrations were negligible in the free flowing portion.

FIGURE C13

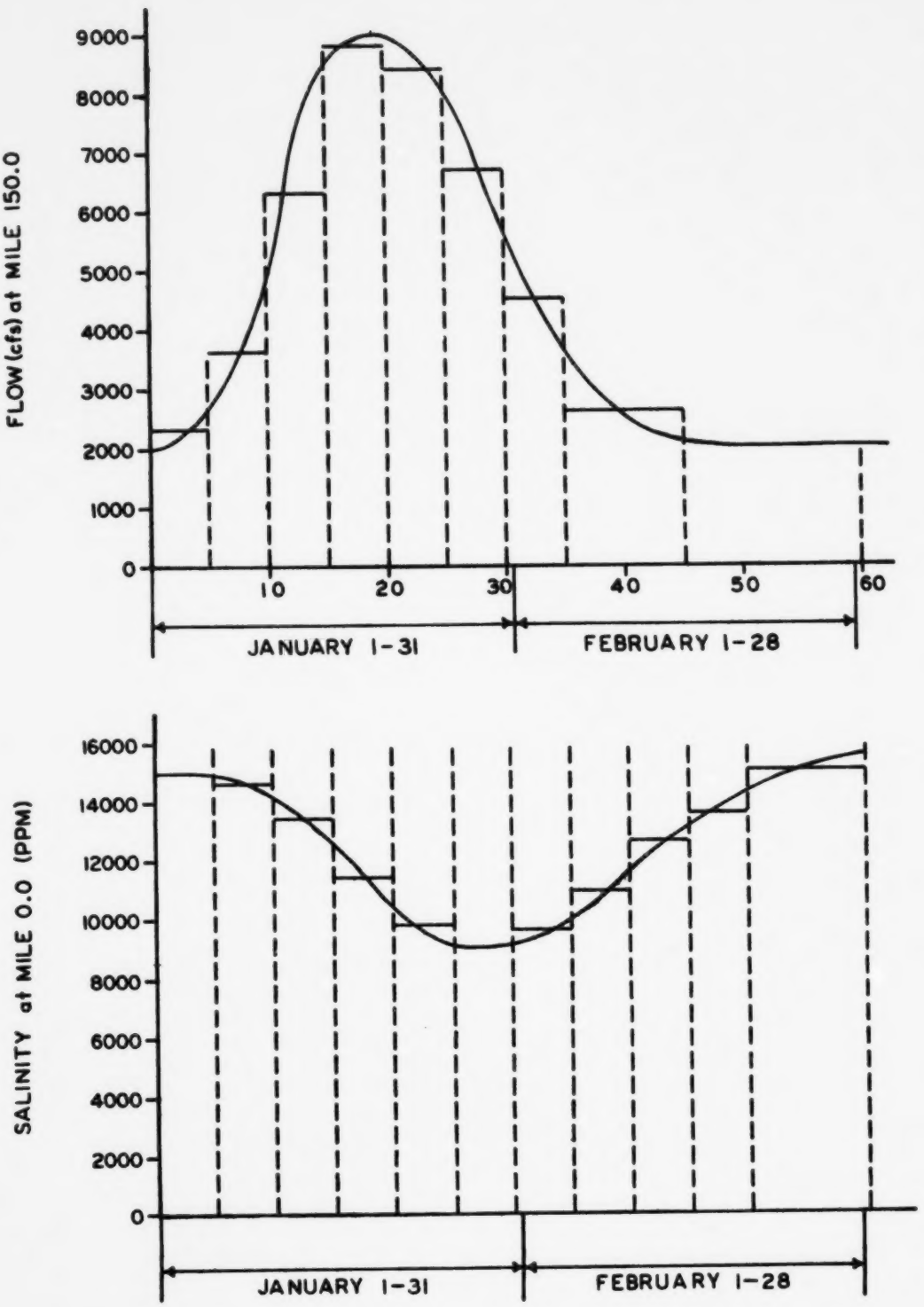

FLOW (cfs) at MILE 150.0
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
10
20
30
40
50
60
JANUARY 1-31
FEBRUARY 1-28
SALINITY at MILE 0.0 (PPM)
16000
14000
12000
10000
8000
6000
4000
2000
0
JANUARY 1-31
FEBRUARY 1-28

FIGURE C14

AUTØQD RUN RESULTS - SELECTED POINTS

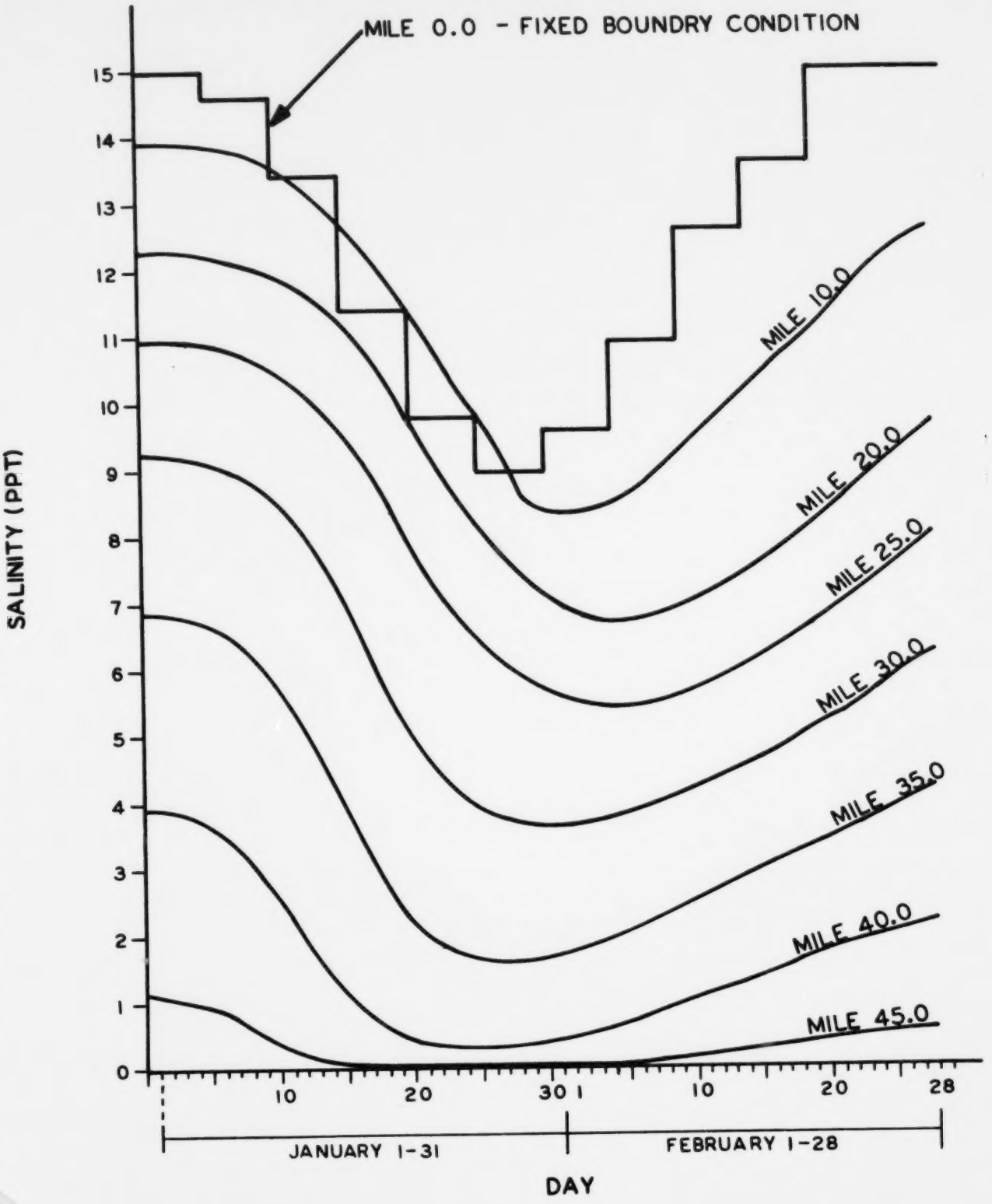


FIGURE C15

AUTØQD RUN RESULTS - SELECTED DATES

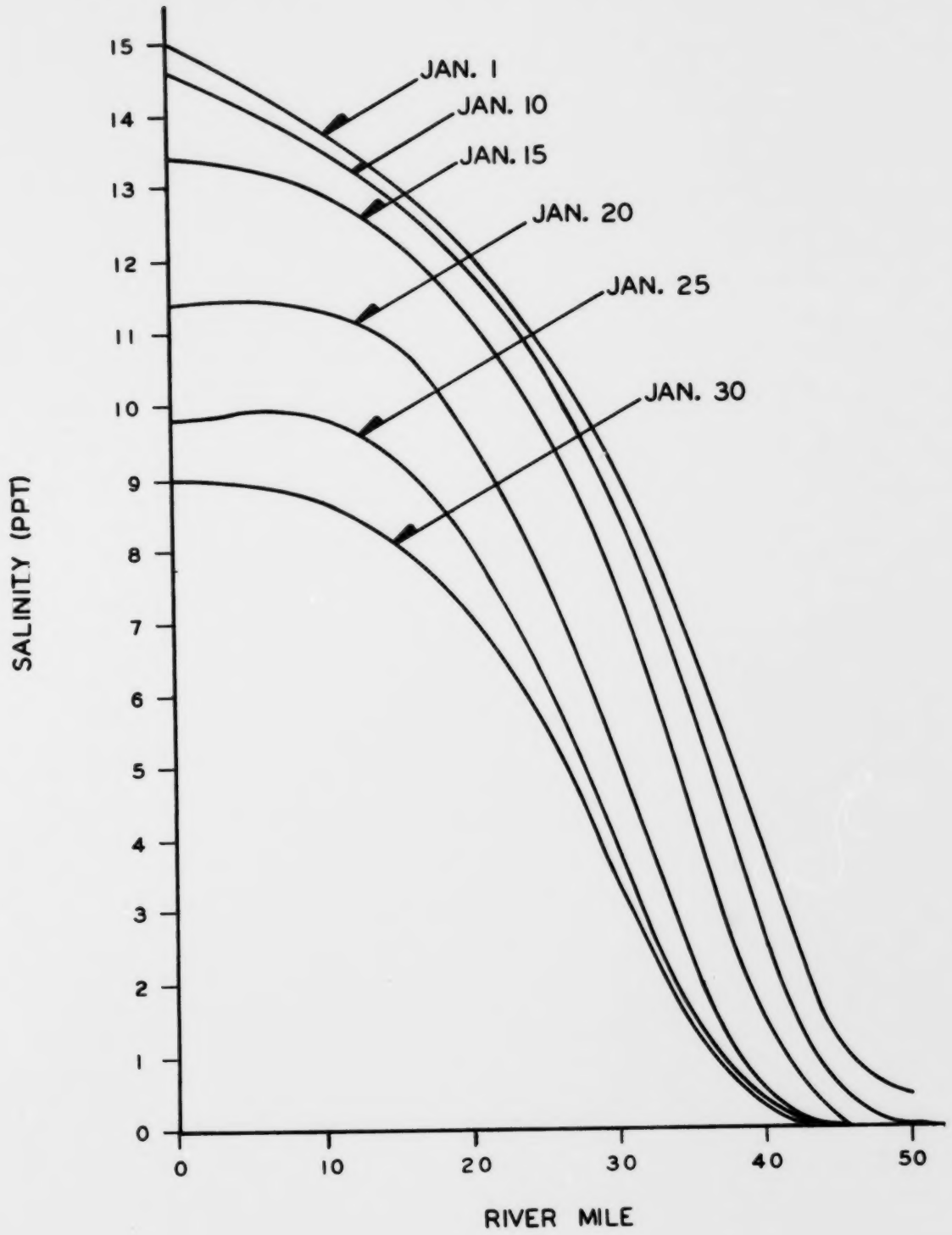
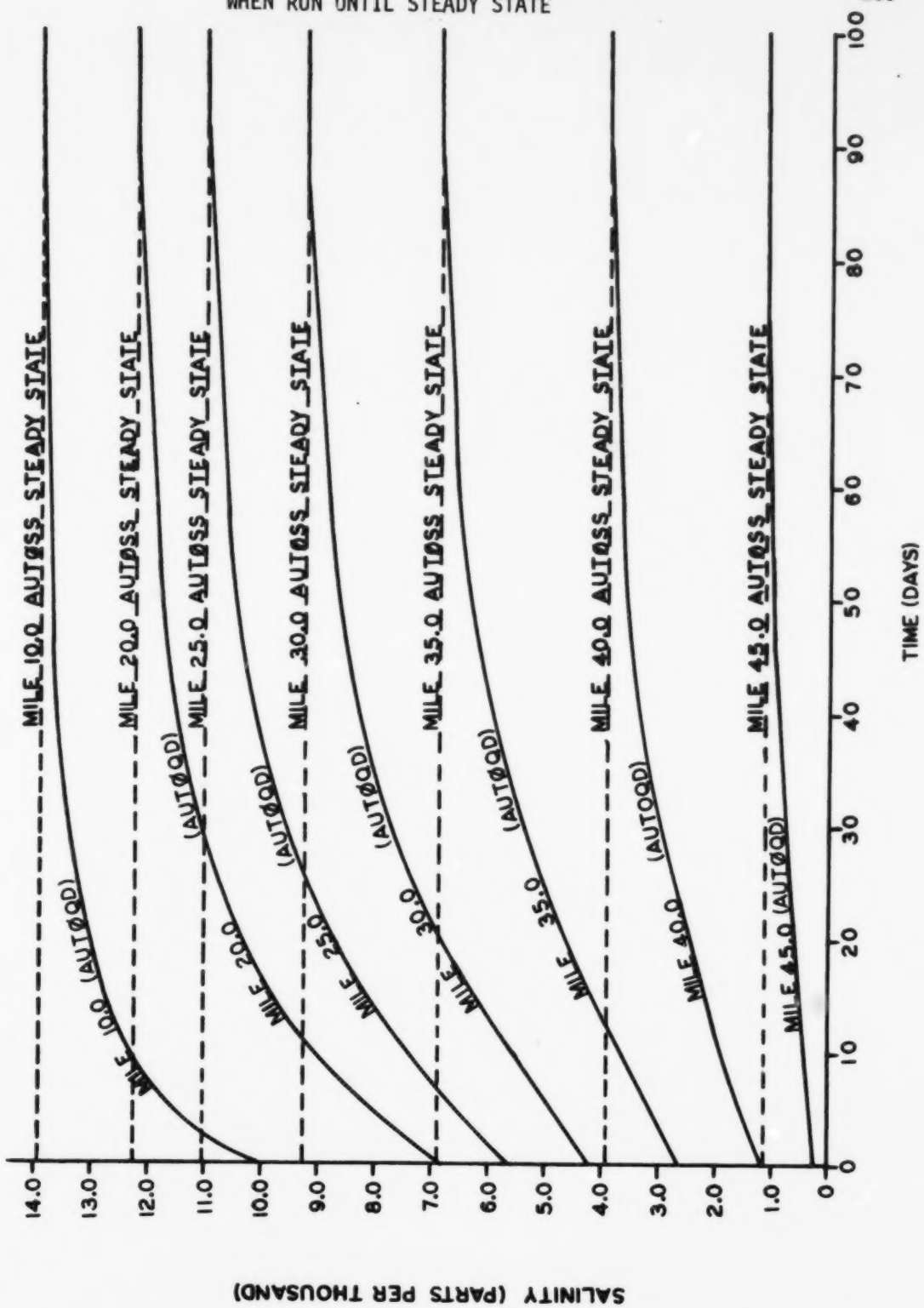


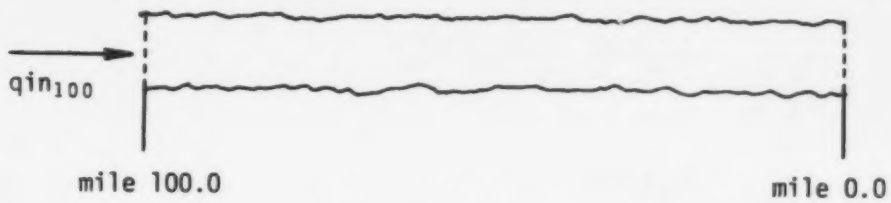
Figure C16 shows a comparison of the AUTØSS steady state solution and the AUTØQD solution as it approaches steady state. A condition with a total-fresh water inflow of 2300.0 cfs (2000.0 cfs river flow and 300.0 cfs total for inputs 1, 2 & 3), and the downstream concentration fixed at 15000.0 ppm, was chosen for this example. The starting concentrations for AUTØQD were purposely chosen not to coinicide with the AUTØSS steady state to better see the two solutions converge. The inputs for these runs are the same as for Figure C4.

FIGURE C16

COMPARISON OF AUTØSS AND AUTØQD
WHEN RUN UNTIL STEADY STATE



For the next set of runs a uniform, free flowing stream was selected. The charateristics of this stream are defined as follows:



Mile of downstream end	0.0
Mile of upstream end	100.0
Mile of fall line	0.0
Number of sections	100

PHYSICAL DATA;

A_1= 0.04

A_2= 0.60

Width = 1000.0 ft.

CBOD decay rate = 0.6@20.0°C (1/day)

DO Saturation = 10.0 ppm

Reaeration rate = 0.4@20.0°C (1/day)

All other physical data assumes their respective default values.

INFLOWS;

@ mile 100.0 1000.0 cfs at 10.0 ppm CBOD & 10.0 ppm DO

All runs have these values as inputs, except for the stated variations.

By using a uniform stream it is possible to make comparisons between the model solution and an analytical solution. For these comparisons the integrated forms of the Streeter-Phelps DO sag equation are used [23];

$$D = \frac{K_C L_o}{K_A - K_D}\left[e^{-(K_D X/U)} - e^{-(K_A X/U)} \right]$$

$$D_C = \frac{K_D L_o}{K_A} e^{-(K_D X_C/U)}$$

$$X_C = \frac{U}{K_A - K_D} \log_e (K_A/K_D)$$

where;

D = dissolved oxygen deficit (ppm) (saturation concentration minus stream concentration)

L_o = in stream BOD (ppm) at X=0, for this application L_o=10.0 ppm at river mile 100.0 (X=0)

K_D = deoxygenation rate (1/day), corresponds to CBOD decay rate

K_A = reaeration rate (1/day)

X_C = distance to location of maximum deficit (miles)

U = stream velocity (miles/day)

D_C = maximun DO deficit (ppm)

These equations are resticted to the case where the initial deficit (@ X=0) is zero, which is the condition specified in the runs. (DO saturation = 10.0)

FIGURE C17

EFFECT OF A_1

(AUTØSS)

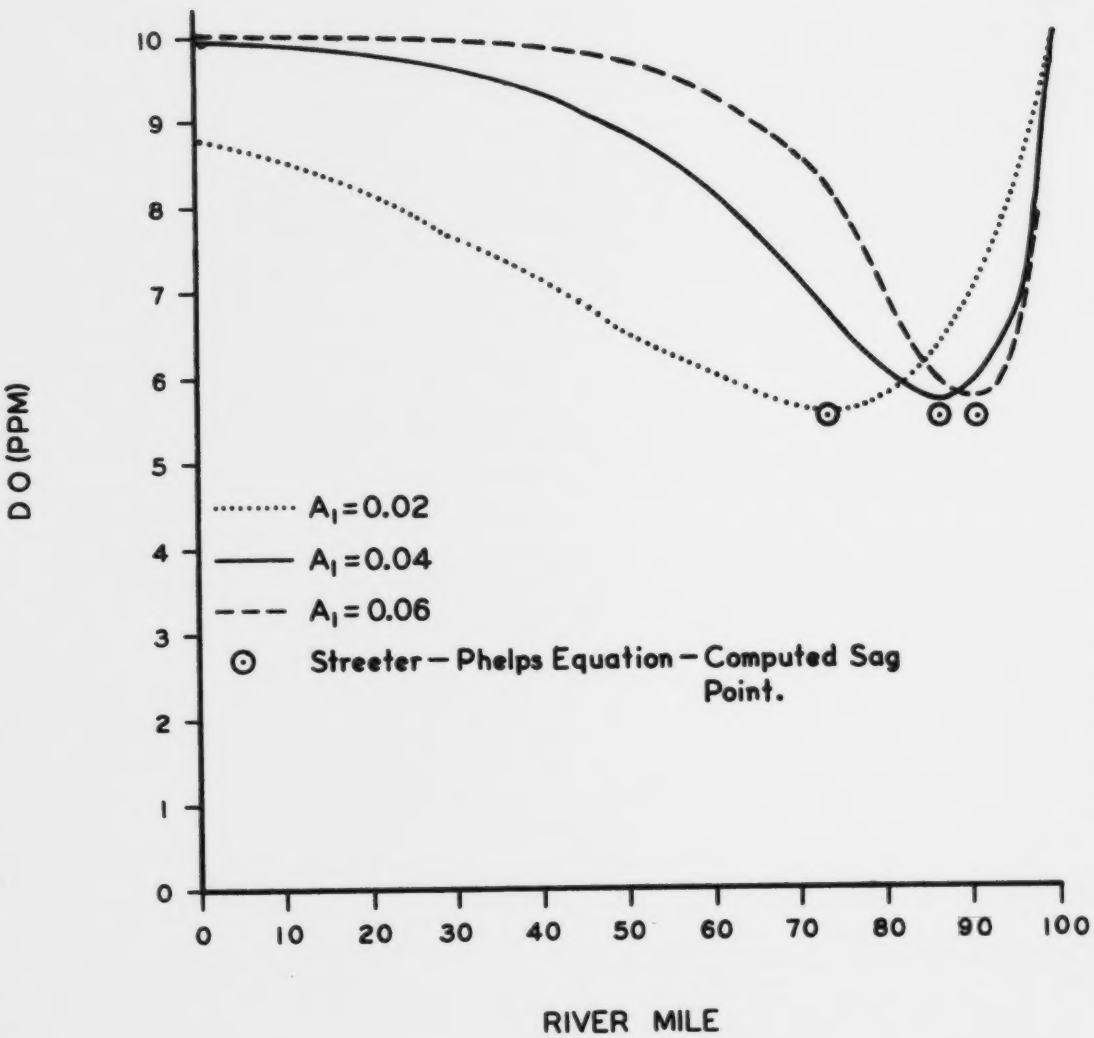


FIGURE C18

EFFECT OF A_2

(AUTØSS)

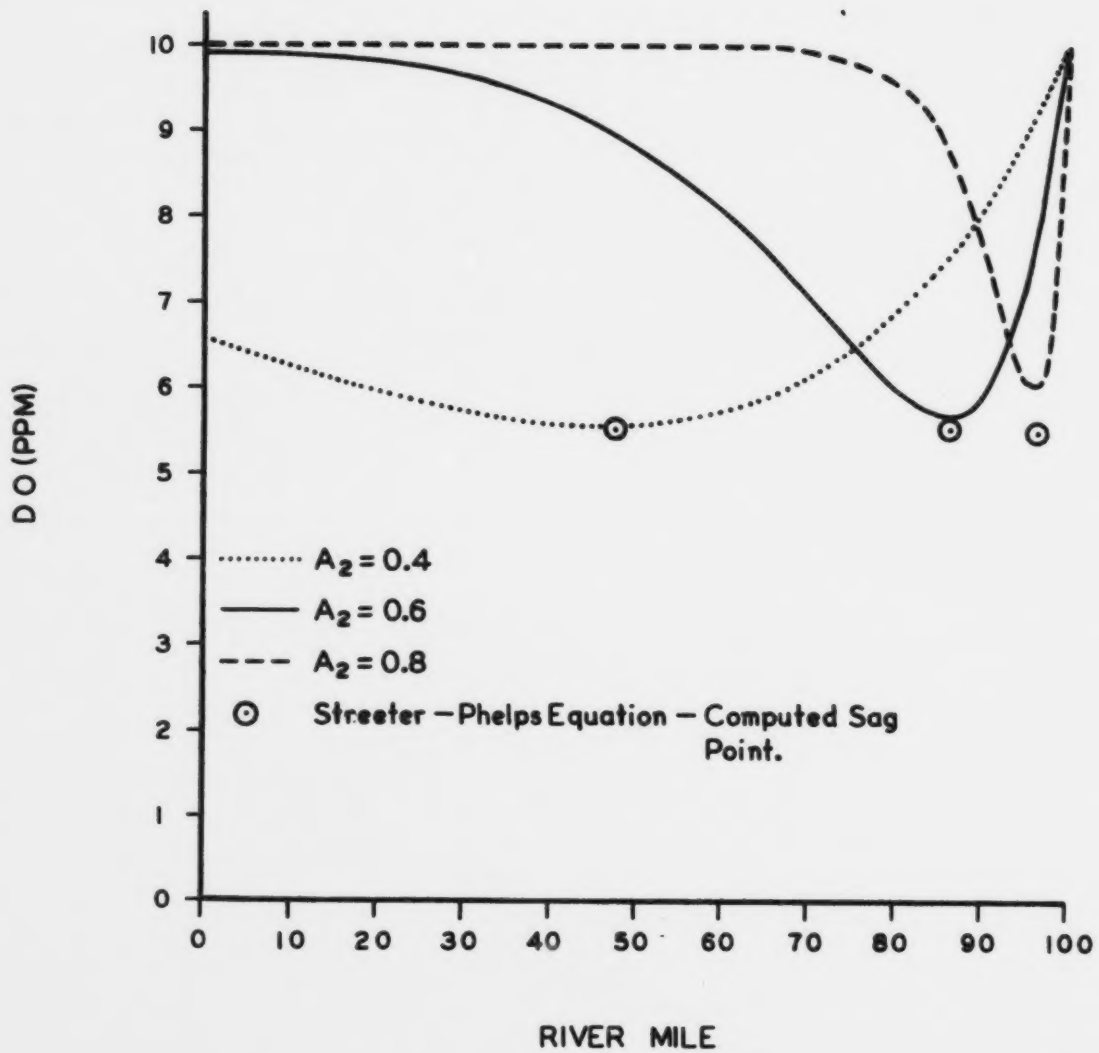
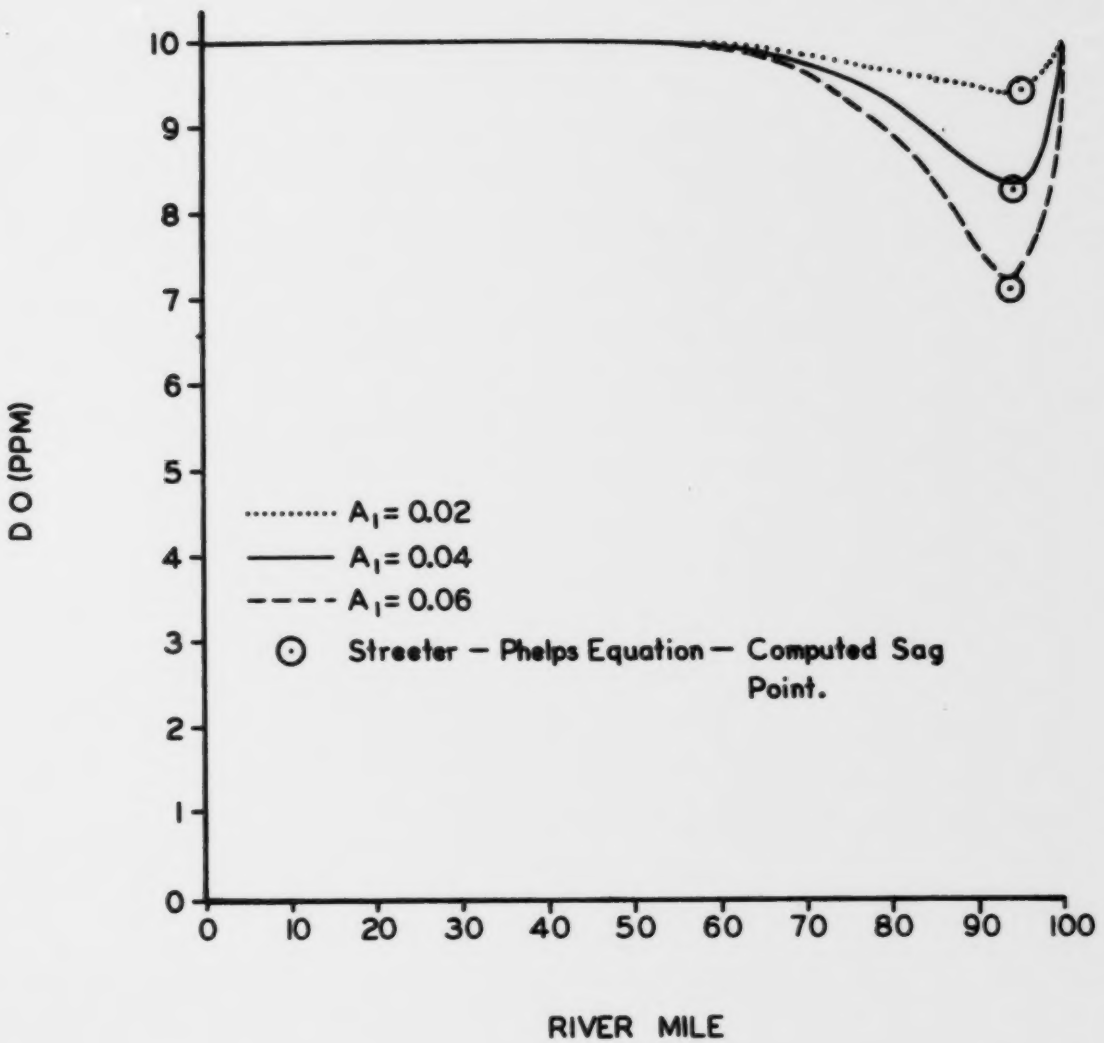


FIGURE C19

EFFECT OF A_1 WITH COMPUTED REAERATION RATES

(AUTØSS)

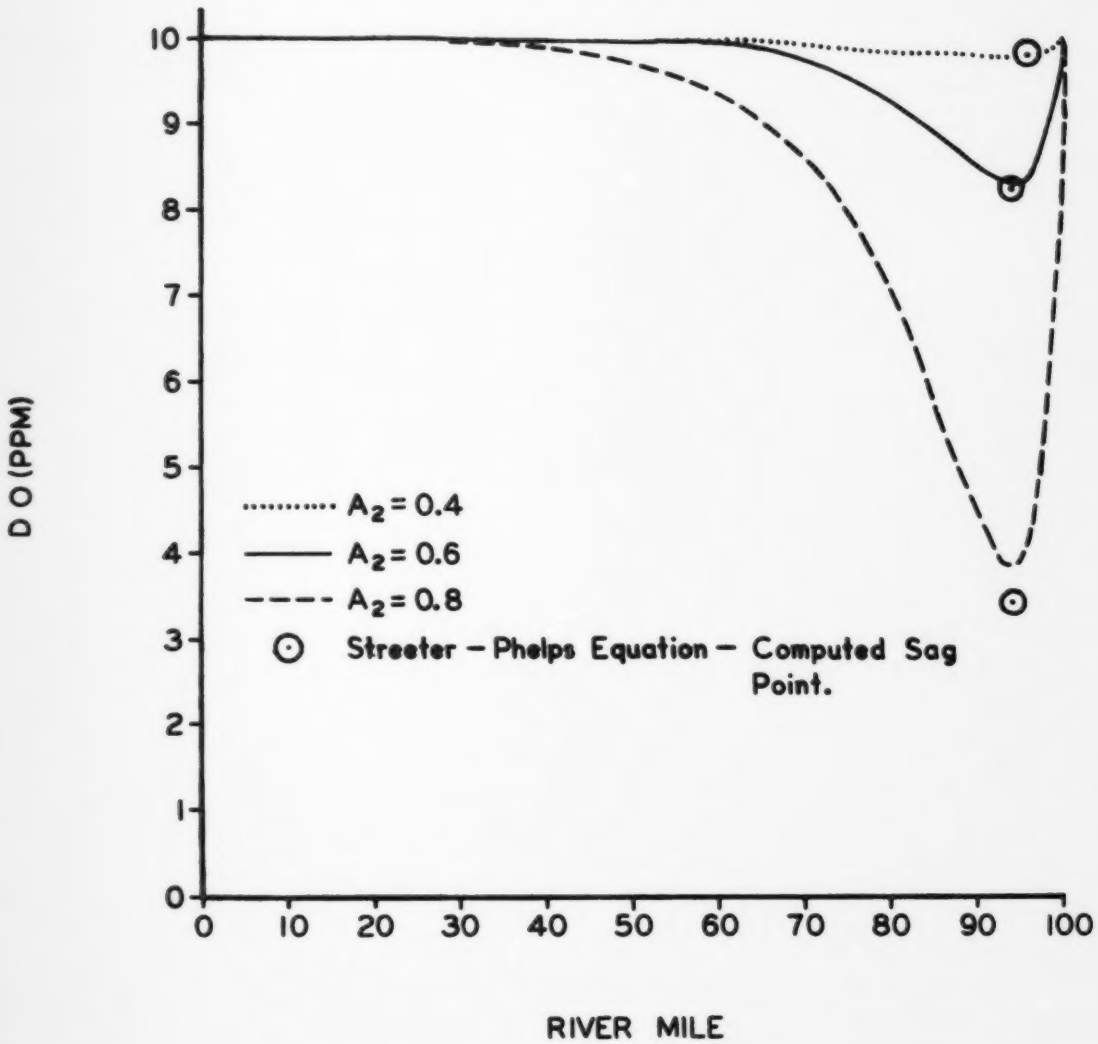


A_1 HAS BEEN VARIED AND REAERATION RATES HAVE BEEN COMPUTED RATHER THAN SPECIFIED AT 0.4 (^{1}/day).

FIGURE C20

EFFECT OF A_2 WITH COMPUTED REAERATION RATES

(AUTØSS)

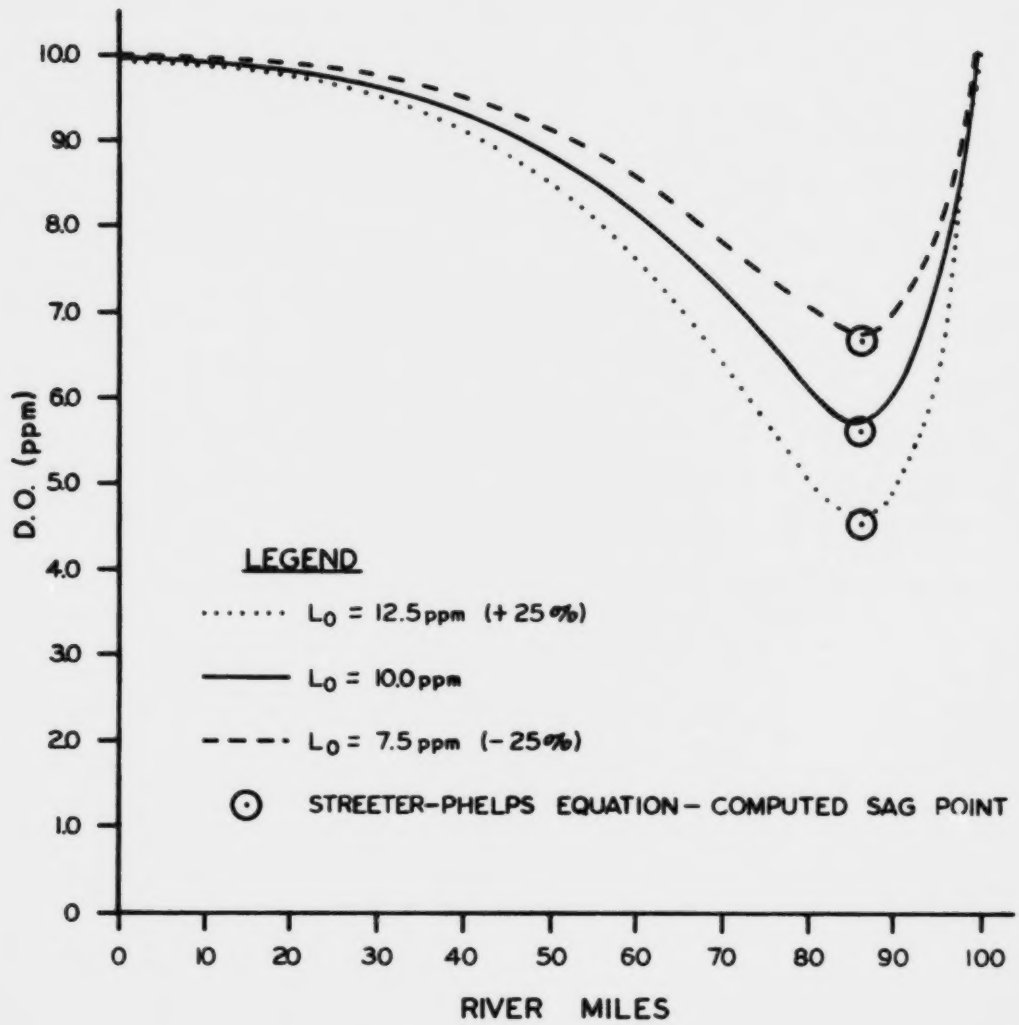


A_2 HAS BEEN VARIED AND REAERATION RATES HAVE BEEN COMPUTED RATHER THAN SPECIFIED AT 0.4 (^{1}/day)

FIGURE C21

EFFECT OF INCOMING LOAD

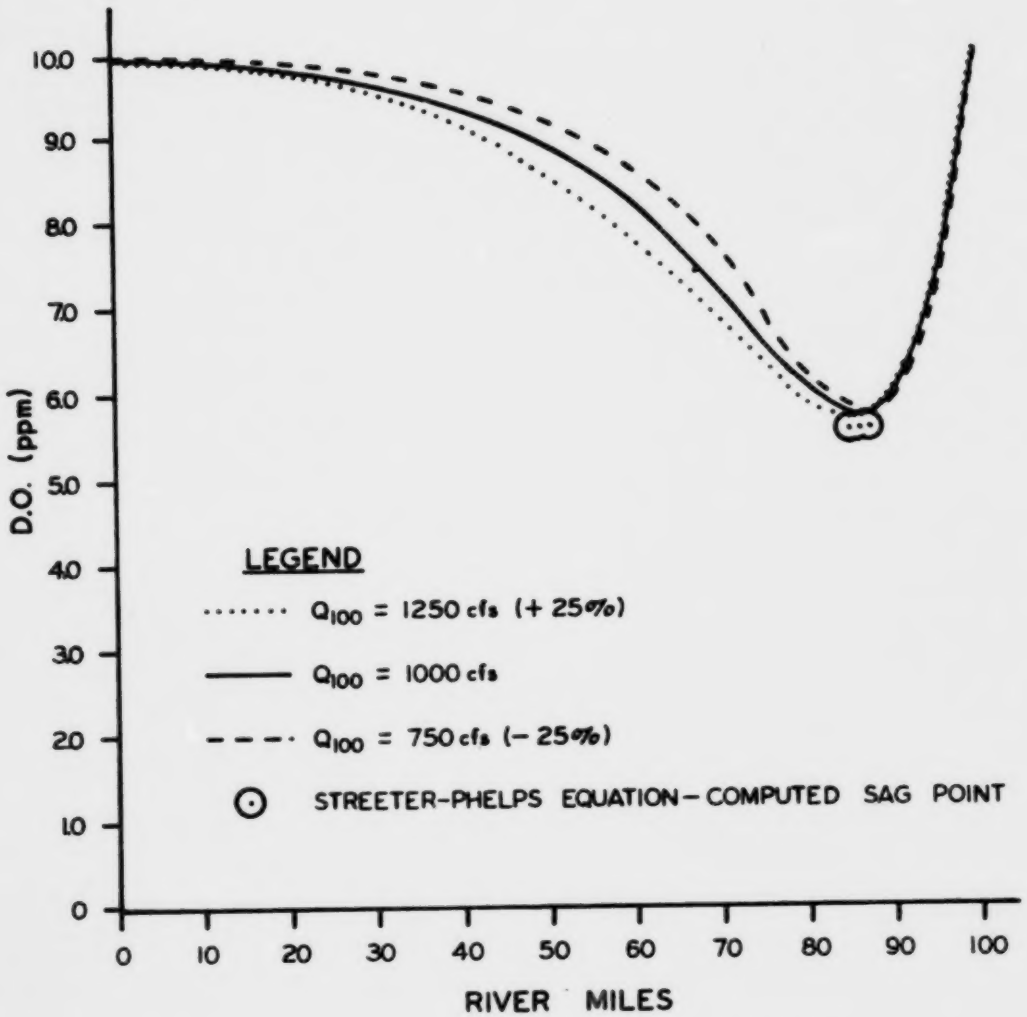
(AUTØSS)



THE INCOMING CBØD CONCENTRATIONS
AT MILE 100.0 (L_0) HAVE BEEN VARIED.

FIGURE C22

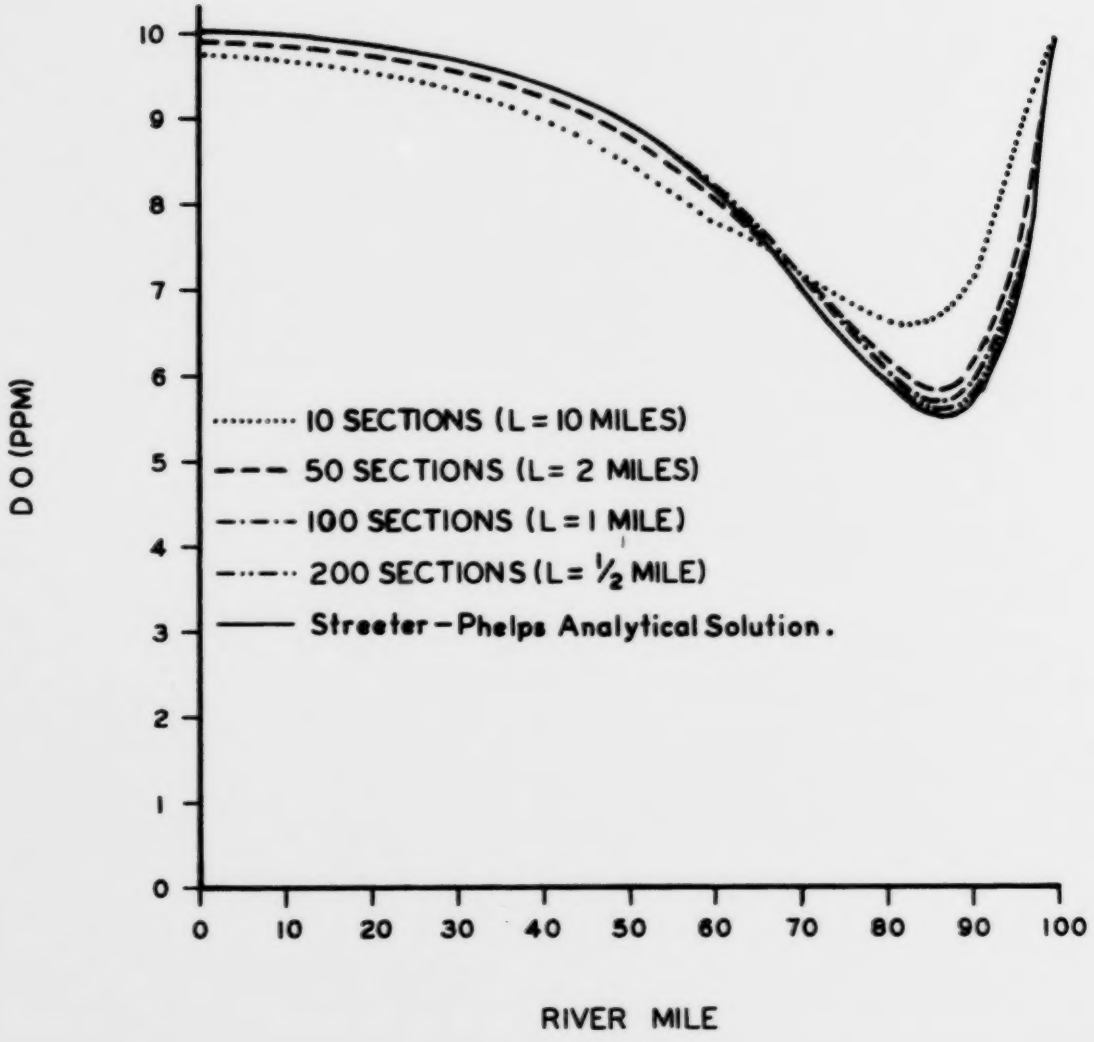
EFFECT OF FLOW RATE



THE INFLOW AT MILE 100.0 (Q_{100}) HAS BEEN VARIED.

FIGURE C23

EFFECT OF NETWORK SIZE



THE SAME INPUT DATA HAS BEEN USED
AND THE NETWORK SIZE HAS BEEN VARIED.

MODEL VERIFICATION:

As stated under Model Calibration, errors in the known quantities will be absorbed by the calibration coefficients. The model verification process should indicate the amount of such errors and give a measure of their effect on the model's prediction of other conditions.

The verification procedure requires that the same amount of information that is required by the calibration step be collected and used as input to the model (AUTØQD). The computed or predicted quality profiles are then compared to the observed profiles.

The two sets of profiles should be in close agreement. If they do not agree within the normal range of laboratory errors, some investigation should be made into the nature of the problems. All of the major inputs to the model should be checked for errors under both the calibration conditions and the verification conditions.

In most cases the source of the errors will be found in the input data. The user's knowledge of the prototype system and the model's sesitivities will be the most valuable guides.

In some cases it may be desirable to recalibrate the coefficients using both observed data sets. The user must be cautioned, however, that in such cases he will not have a verified model, and another verification period must be monitored, predicted and compared.

Common sense indicates that extreme conditions, such as periods of heavy algal blooms, drought conditions, or winter temperatures should not be used for either the calibration or verification steps. The various rates and functional forms incorporated in the AUTØ-QUAL set are not generally adequate to describe extreme conditions.

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2, 3, 4. STØRET, CPSF and AUTØMAP are components of the Water Quality Information System operated by the Monitoring and Data Support Division of the Office of Air and Water Programs, U. S. Environmental Protection Agency, Washington, D. C.

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10. See Reference # 5.

11. See p. 96 of Reference # 8.

12. See p. 221 of Reference # 9.

13. See pp. 218-219 of Reference # 9.

14. See p. 219 of Reference # 9.

15. Hyer, P. V., C. S. Fang, E. P. Ruzecki, and W. J. Hargis, Jr., "Hydrography and Hydrodynamics of Virginia Estuaries, Part II, Studies of the Distribution of Salinity and Dissolved Oxygen in the Upper York System," Special Report in Applied Marine Science and Ocean Engineering Number 13, Virginia Institute of Marine Science, Gloucester Point, Virginia, p. 41, August 1971.

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21. McCalla, T. R., "Introduction to Numerical Methods and FØRTRAN Programming," John Wiley and Sons, New York, pp. 180-185, 1967.

22. See pp. 310-313 of Reference # 21.

23. "Simplified Mathematical Modeling of Water Quality," Hydroscience, Inc., Environmental Protection Agency, p. 72, March 1971.